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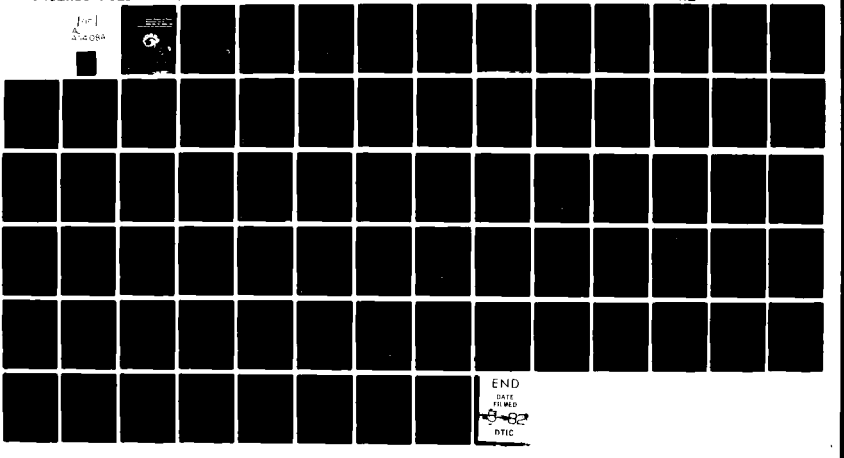
CHEMICAL, BIOLOGICAL, AND PHYSICAL MEASUREMENTS FROM THE MEDITE--ETC(U)
JAN 82 D M LAVOIE, I P DEPALMA, D F REID
UNCLASSIFIED NORDA-TN-138 NL



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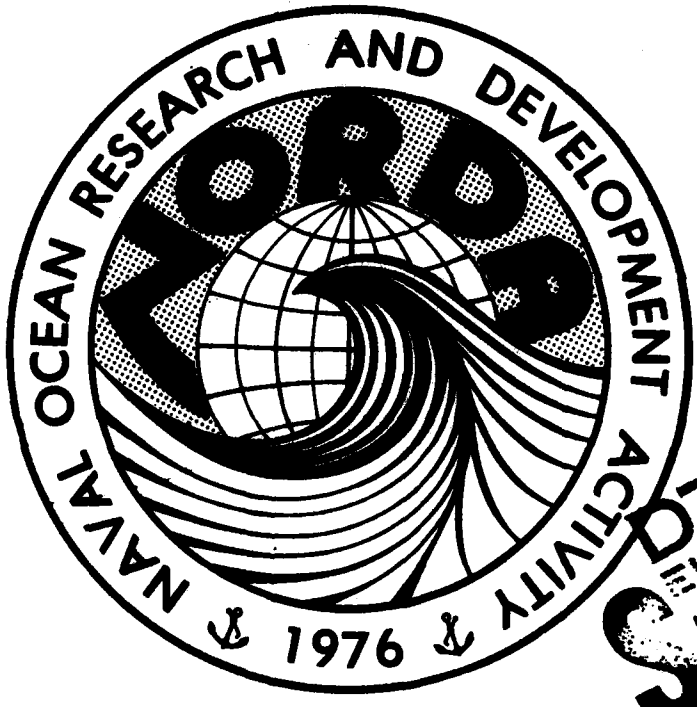
NORDA Technical Note 138

Naval Ocean Research
Development Activity
NSTL Station, Mississippi 39529

Chemical, Biological, and Physical Measurements from the Mediterranean Sea, Summer 1980



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EXECUTIVE SUMMARY

This report ~~is a summary of~~ summarizes data collected in the Mediterranean Sea during the late summer of 1980. Vertical profiles through most of the water column were obtained for the following parameters: conductivity, temperature, salinity, nephelometry, total suspended matter, dissolved and particulate organic carbon, adenosine triphosphate (ATP), chlorophyll and phaeopigments, nutrients (nitrate, ammonium, phosphate, silicate), dissolved oxygen and dissolved reduced gases (methane, hydrogen, nitrous oxide). Results are presented as: (1) tables of measured and derived parameters; (2) depth profiles of unnormalized values, normalized values, and normalized rates of change. Descriptions of the collection and analytical procedures are also given.

Introduction

This technical note constitutes the final data set for the second cruise of a NORDA Code 334 (Biological and Chemical Oceanography Branch) program undertaken in conjunction with elements of Texas A&M University to study the relationship between near-surface nepheloid (suspended particle) layers and dissolved reduced gases in the open ocean. The cruise was conducted as part of the first phase of the field program, during which we sought to (1) examine several oceanic regions to determine the generality of the occurrence of concentration maxima for the reduced gases methane (CH_4), hydrogen (H_2), and nitrous oxide (N_2O) in the oxygenated, near-surface layers of the open ocean; and (2) examine a wide range of physical, chemical, and biological parameters in an effort to establish relationships with the gas distributions. The ultimate goal is to identify the in situ sources and sinks for these gases in oceanic near-surface waters.

The data are summarized in tables of the measured and derived parameters for each hydrostation. The tables are followed by depth profiles of three different treatments of the data for selected parameters. Collection and analytical procedures are detailed in the Appendix.

Cruise Description

The program was conducted aboard the USNS BARTLETT, Cruise 1309-80, which departed Naples, Italy, on 26 August 1980 and terminated at Rota, Spain, on 15 September 1980. Between 28 August and 13 September, ten stations were successfully completed within the Mediterranean Sea and one was completed just outside the Straits of Gibraltar (see Fig. 1). Cruise participants and their collection and/or analytical responsibilities are listed in Appendix A.

Station Protocol

In general, stations were taken during darkness since daylight interferes with the nephelometer sensor. The sampling package consisted of a CTD probe (Conductivity/Temperature/Depth, Neil Brown Instr., Cataumet, MA) co-mounted on a large frame with a Nephelometer (SeaMarTek, Seattle, WA) and with twelve 30 liter PVC Niskin bottles which were tripped using an electronically controlled Rosette Sampler (frame, Niskin bottles, and rosette sampler by General Oceanics, Miami, FL). The package, standing about 2 m high and weighing almost 900 kg upon retrieval, was lowered on a single conductor, armored cable from the stern U-frame. During lowering, vertical profiles of conductivity, temperature, and nephelometry vs. depth were continuously plotted on X-Y plotters. Based on the profiles, sampling depths were chosen, the Niskin bottles raised to each desired sample depth and tripped while maintaining a slow upward motion to minimize the probability of contamination. Once on deck, water samples were drawn from the Niskin bottles as appropriate to the lability of the parameters being measured, with gas samples being drawn first. To provide profile detail in the shallow zone, the most intense sampling was done in the upper 120 m or so; one entire cast of 12 bottles would be tripped in this region. A second cast of 12 bottles, and occasionally a third, covered the remainder of the water column. Only the first 24 bottles are tabulated here.

The following parameters were measured or calculated on board: conductivity, in situ temperature and pressure (all from the CTD), depth, CTD

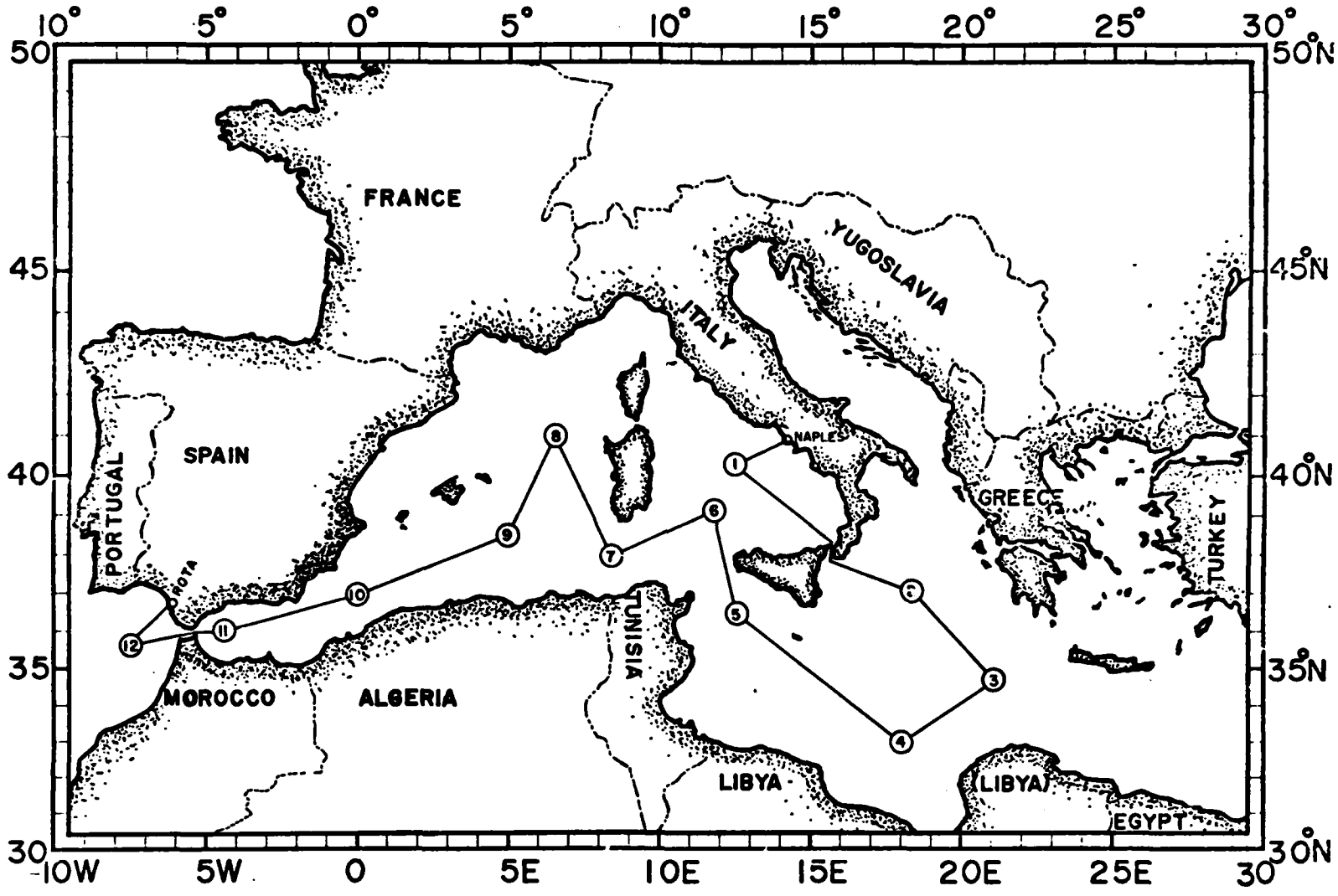

Figure 1. Cruise track, USNS BARTLETT, Cruise 1309-80

salinity, Niskin sample salinity, nephelometry (light scattering at 90°), and nutrients (NO_2^-, $NO_3^=$, NH_4^+, $PO_4^=$, $Si(OH)_4$), and the dissolved gases O_2, CH_4, N_2O, H_2. The following parameters were measured or calculated from samples or data brought back to the laboratory: potential temperature, sigma t, total suspended matter (TSM), dissolved and particulate organic carbon (DOC AND POC) chlorophyll and phaeopigment (chlorophyll degradation product), and adenosine triphosphate (ATP, a measure of living biomass). Special collection procedures as well as the essential elements of the analytical methods may be found in Appendix B.

Data Tables

The data for the first 24 depths are tabulated for each station. The following comments apply:

1. Where a blank appears, no measurements were taken; where a zero appears, the parameter was below detectable limits.

2. Nutrient, CH_4 and N_2O data were supplied by Dr. James Brooks, Texas A&M University; Drs. Mary Scranton, SUNY at Stony Brook, and Mark Jones, NRL, supplied the H_2 data (Scranton and Jones, submitted). Their permission to include their data here is gratefully acknowledged.

3. The CTD salinity and the Bottle Salinity (i.e., that measured from Niskin bottle sample on board) do not often agree exactly, even though the CTD sensors had been precisely calibrated just prior to the cruise and the CTD salinity was calculated from digital data recorded while the bottle was being tripped (a process requiring some 30 seconds). The discrepancy can be mostly accounted for by three factors: (1) that the CTD sensors and the Niskin bottles were separated on the frame by approximately 1 meter; (2) that this separation was probably significant in terms of the scales of conductivity and temperature fine structure seen in the continuous CTD profiles; (3) that the CTD data were recorded in the turbulent wake of the large, ascending package.

4. TSM samples were collected in a separate cast from the chemical data at sampling depths chosen on the basis of the continuous nephelometry trace. Thus, the TSM sample depths did not always correspond to the chemistry sample depths. In the tables, TSM values have been placed at the closest chemistry sample depths, and in most cases, they are within a few meters of their actual depths.

5. Table Legend:

Depth: (meters) calculated from CTD pressure reading (from Saunders, 1981);

In Situ Temp: (degrees Celsius) Temperature from CTD reading;

Poten Temp: (degrees Celsius) Potential temperature calculated from CTD pressure and temperature readings (Bryden, 1973);

CTD Salin: (parts per thousand) Salinity calculated from CTD readings; using the Bennett-Dauphinee algorithm (Mayoral, 1979)

Bottle Salin: (Parts per thousand) Salinity of Niskin sample; measured with a Guildline Autosal.

Sigma T: ((density - 1) x 10^3) Density anomaly using CTD salinity and temperature (Millero et al., 1980);

TSM: (µg/liter of sea water) Total Suspended Matter (gravimetric);

Nephels; arbitrary units of nephelometry (scattering at 90° by suspended particles);

CH(4): (nl/L) Dissolved methane;

H(2): (nl/L) Dissolved hydrogen;

N(2)O: (nl/L) Dissolved nitrous oxide;

O(2): (ml/L) Dissolved oxygen;

POC: (µg Carbon/L) Particulate organic carbon;

DOC: (µg Carbon/L) Dissolved organic carbon;

Total Chloro: (µg/L) Total chlorophyll "a" (chl "a");

Total Phaeo: (µg/L) Total phaeopigment (i.e. chlorophyll degradation products);

<20 um Chloro: (µg/L) Chlorophyll "a" of particles less than 20 µm;

<20 um Phaeo: (µg/L) Phaeopigment of particles less than 20 µm;

>20 um Chloro: (µg/L) Chl "a" of particles larger than 20 µm;

>20 um Phaeo: (µg/L) Phaeopigment of particles greater than 20 µm;

Total ATP: (ng/L) ATP of particles from 200 to 0.2 µm diameter;

Micro ATP: (ng/L) ATP of particles 200 to 20 µm diameter;

Nano ATP: (ng/L) ATP of particles 20 to 2 µm diameter;

Pico ATP: (ng/L) ATP of particles 2 to 0.2 µm diameter;

NO(3): (µg-atoms/L = µM) Nitrate;

NO(2): (µg-atoms/L = µM) Nitrate;

NH(4): (µg-atoms/L = µM) Ammonium;

PO(4): (µg-atoms/L = µM) Orthophosphate;

SiO(4): (µg-atoms/L = µM) Silicate;

Depth Profiles

As an aid to perceiving relationships among the data, depth profiles are presented for the twelve most important parameters: temperature, salinity, sigma t, chlorophyll "a", micro and nano ATP, methane, hydrogen, nitrous oxide, nephelometry (or TSM), particulate organic carbon, and dissolved oxygen. All the profiles have the same depth scale -- 0 to 200 m -- and the parameters are arranged to facilitate intercomparison at each depth. The upper dashed line in most of the profiles marks the approximate bottom of the mixed layer or top of the pycnocline; the lower dashed line in stations 3, 6, 8, and 12 marks the approximate 1% light level. There are three types of profiles, each presenting a different aspect of the data:

A. Straight Data. - Useful for comparing magnitudes of the parameters from station to station. Parameters and their units are as in the Table Legend.

B. Values as % of Maximum. Each parameter is normalized to its maximum value in the upper 200 m for each station. These plots allow immediate identification of the depth of maximum value and facilitate comparisons among the parameters.

C. Average Gradient, Normalized to Maximum. The change per meter was determined between two succeeding depths, was normalized to the maximum rate of change in the upper 200 m, and the normalized value was plotted halfway between the depths. The gradient scale runs from -1 (maximum rate of decrease) through 0 (no change) to +1 (maximum rate of increase). (It should be noted that, since the data set consists of discrete values only, one cannot interpolate gradient values between points on this plot, only the gradient sign). These plots facilitate interparameter comparisons of gradient with depth.

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DATA TABLES

USNS BARTLETT 1309-80

STATIONS 2 THROUGH 12

BARTLETT 1309-80 Stn 2

DATE: 8/28/80 POSITION: 37.04N;18.35E BOTTOM DEPTH: 3500m

DEPTH (m)	Poten Temp (deg C)	InSitu Temp (deg C)	CTD Salin (0/00)	Bottle Salin (0/00)	Sigma t	TSM (ug/L)	Nephels (arbit)	CH(4) (nl/L)	H(2) (nl/L)	N(2)O (nl/L)	O(2) (ml/L)	POC (ugC/L)	DOC (ugC/L)
1	25.557	25.557	38.695	38.709	25.97	28			23				
11	25.482	25.485	38.707	38.563	26.00	44			36			21	657
20	23.858	23.863	38.618	38.572	26.43				18			21	653
30	20.220	20.226	38.558	38.602	27.43	59			12			25	807
39	19.206	19.214	38.599	38.589	27.72	108			7			21	538
49	18.772	18.781	38.649	38.524	27.88				11			14	609
59	17.159	17.170	38.506	38.570	28.17	74	1603		6			15	554
68	16.087	16.099	38.548	38.572	28.46		2733		6			25	654
79	15.455	15.468	38.559	38.593	28.62	86	2659		4			10	524
88	15.196	15.210	38.600	38.641	28.71		2549		5			24	554
98	15.074	15.090	38.630	38.709	28.76	133	2356		5			19	452
109	14.962	14.980	38.690	38.704	28.83		2072		5			17	527
115	14.832	14.850	38.642	38.671	28.82				4				
136	14.542	14.563	38.649	38.673	28.89	28	1689		5				
156	14.579	14.604	38.710	38.739	28.93		1423		10				
169	14.668	14.695	38.802	38.809	28.98		1264		7			10	618
194	14.673	14.704	38.823	38.848	28.99	52	1291		16			10	477
244	14.780	14.819	38.902	38.918	29.03		1369		10			8	474
291	14.696	14.733	38.911	38.923	29.05		1289		9			6	402
340	14.573	14.627	38.901	38.931	29.07		1272		6			4	
390	14.423	14.485	38.873	38.920	29.08	15	1316		10				412
439	14.314	14.383	38.859	38.897	29.09		1266		5			6	
486	14.219	14.295	38.843	38.903	29.10		1234		14			6	386
584	13.986	14.077	38.797	38.861	29.11	20	1174		15				358

STN 2 BARTLETT 1309-80

BARTLETT 1309-80 Stn 2

DATE: 8/28/80 POSITION: 37.04N;18.35E BOTTOM DEPTH: 3500m

DEPTH (m)	Total Chloro ug/L	Total Phaeo ug/L	<20um Chloro ug/L	<20um Phaeo ug/L	>20um Chloro ug/L	>20um Phaeo ug/L	Total ATP ng/L	Micro ATP ng/L	Nano ATP ng/L	Pico ATP ng/L	NO(3) (ugA/L)	NO(2) (ugA/L)	NH(4) (ugA/L)	PO(4) (ugA/L)	SiO(4) (ugA/L)
1	0.016	0.061					6.57	2.05	2.09	2.43	0.60	0.16	1.0	0.38	2.80
11	0.022	0.005					25.70	14.67	3.04	8.00	0.55	0.16	1.0	0.33	2.80
20	0.023	0.005					11.92	3.54	3.52	4.36	0.55	0.15	1.0	0.36	3.10
30	0.023	0.005					9.20	3.18	3.44	2.58	0.50	0.16	1.0	0.40	2.80
39	0.034	0.013					11.39			2.15	0.60	0.15	1.0	0.38	2.80
49	0.056	0.008					9.73	6.33	1.70	1.70	0.60	0.16	1.0	0.38	3.10
59	0.074	0.009					8.32	1.00	3.90	3.41	0.60	0.16	1.0	0.40	2.80
68	0.083	0.016					10.15	2.94	3.75	3.47	0.60	0.16	1.0	0.40	2.80
79	0.129	0.015					14.39	5.51	3.19	5.68	0.60	0.16	1.1	0.43	3.40
88	0.119	0.027					16.69	8.63	2.55	5.51	0.55	0.14	1.0	0.45	3.40
98	0.176	0.026					9.37	2.57	2.97	4.44	0.60	0.15	1.0	0.45	3.40
109	0.057	0.091					5.19	0.64	1.77	2.78	0.55	0.15	1.0	0.38	2.50
115	0.108	0.093					15.00	10.33	2.23	1.89	0.60	0.18	1.1	0.45	3.10
136	0.044	0.075						13.64	1.37		1.36	0.18	1.1	0.43	3.10
156	0.014	0.054					4.33	3.06	0.69	0.58	1.91	0.17	0.9	0.33	3.40
169	0.012	0.014					12.15	11.00	0.60	0.55	2.18	0.17	0.9	0.33	3.80
194	0.004	0.009					6.07	4.31	0.77	0.49	2.51	0.16	0.9	0.38	4.10
244	0.001	0.003					1.14	0.22	0.53	0.39	3.11	0.16	0.9	0.38	4.40
291	0.001	0.003					0.82	0.14	0.38	0.30	3.11	0.18	0.9	0.38	5.00
340		0.003					2.30	0.38	1.17	0.76	3.33	0.18	1.0	0.38	5.00
390		0.002					0.99	0.38	0.38	0.22	3.37	0.17	1.0	0.33	5.60
439		0.003					2.36	0.36	1.16	0.84	4.15	0.17	1.0	0.33	5.90
486		0.002					1.31	0.05	0.63	0.63	4.42	0.16	1.0	0.40	6.30
584		0.001					1.37	0.00	0.64	0.74	4.85	0.16	1.0	0.40	6.90

STN 2 BARTLETT 1309-80

BARTLETT 1309-80 Stn 3

DATE: 8/29/80 POSITION: 34.67N;21.03E BOTTOM DEPTH: 2523m

DEPTH (m)	Poten Temp (deg C)	Insitu Temp (deg C)	CTD Salin (0/00)	Bottle Salin (0/00)	Sigma t	TSM (ug/L)	Nephels (arbit)	CH(4) (nl/L)	H(2) (nl/L)	N(2)O (nl/L)	O(2) (ml/L)	POC (ugC/L)	DOC (ugC/L)
0	25.808	25.808	38.675	38.692	25.38	60		52	22	171		21	479
11	25.766	25.769	38.686	38.699	25.90			50	23	171		14	461
19	25.562	25.566	38.674	38.602	25.95	253		50	24	181		14	510
28	18.123	18.123	37.655	37.685	27.23			81	16	245		17	294
37	17.125	17.133	37.873	37.900	27.69	69		73	12	283		20	473
48	17.211	17.219	38.234	38.212	27.95			79	15	225		14	410
57	15.908	15.918	38.207	38.252	28.24	121		84	11	235		21	402
67	15.653	15.664	38.480	38.511	28.51			54	14	197		16	595
76	15.595	15.608	38.607	38.609	28.62	31	2053	65	15	233		12	377
90	15.515	15.530	38.724	38.740	28.73		2103	65	21	215		11	673
98	15.393	15.414	38.766	38.788	28.79	23	1957	65	17	231		7	577
105	15.227	15.244	38.754	38.759	28.32		1810	61	17	244		7	478
117	15.124	15.143	38.805	38.795	28.38	29	1763	60	10	227		2	437
127	15.074	15.095	38.826	38.835	28.91		1624	60	14	211		9	431
139	14.974	14.996	38.847	38.886	28.95		1378	58	11	232		2	438
147	14.972	14.996	38.873	38.882	28.97	18	1349	63	9	256		8	339
169	14.836	14.913	38.889	38.892	29.00		1301	67	8	241		1	387
197	14.859	14.891	38.913	38.922	29.02		1209	75	9	239		4	353
245	14.749	14.788	38.924	38.932	29.05	21	1156	63	10	255		4	356
291	14.616	14.662	38.919	38.922	29.08		1130	61	9	248		3	321
389	14.368	14.429	38.880	38.888	29.10		1112	53	5	256		3	368

STN 3 BARTLETT 1309-80

BARTLETT 1309-80 Stn 3

DATE: 3/29/80 POSITION: 34.67N;21.03E BOTTOM DEPTH: 2523m

DEPTH (m)	Total Chloro ug/L	Total Phaeo ug/L	<20um Chloro ug/L	<20um Phaeo ug/L	>20um Chloro ug/L	>20um Phaeo ug/L	Total ATP ng/L	Micro ATP ng/L	Nano ATP ng/L	Pico ATP ng/L	NO(3) (ugA/L)	NO(2) (ugA/L)	NH(4) (ugA/L)	PO(4) (ugA/L)	SiO(4) (ugA/L)
0	0.010	0.001					11.80			4.30	0.53	0.14	1.1	0.30	2.60
11	0.017	0.002					36.05	24.24	1.95	9.87	0.53	0.14	1.2	0.30	2.40
19	0.026	0.004					37.70	27.40	5.72	4.58	0.53	0.13	1.2	0.30	2.10
28	0.030	0.009					34.17	22.68	5.02	6.48	0.53	0.13	1.1	0.30	2.10
37	0.044	0.009					24.05	10.52	5.98	7.56	0.53	0.13	1.1	0.30	2.40
48	0.058	0.024					21.82	8.95	5.54	7.33	0.53	0.14	1.1	0.30	2.40
57	0.046	0.021					26.10	11.94	5.92	8.24	0.53	0.12	1.1	0.30	2.40
67	0.073	0.055					28.25	17.15	4.86	6.26	0.53	0.13	1.1	0.27	2.90
76	0.134	0.037					15.89	7.05	3.32	5.52	0.53	0.14	1.1	0.30	3.50
90	0.149	0.053					23.65	16.20	2.88	4.58	0.53	0.14	1.1	0.30	3.50
98	0.144	0.081					9.27	0.99	3.32	4.96	0.59	0.14	1.1	0.30	3.20
105	0.144	0.083					13.44	7.32	2.57	3.55	0.88	0.18	1.1	0.30	3.50
117	0.091	0.119					22.53	16.72	2.65	3.16	1.41	0.22	1.0	0.30	3.50
127	0.045	0.168					16.32	11.78	2.05	2.49	1.82	0.21	1.0	0.33	3.50
138	0.040	0.067					14.64	9.92	2.15	2.56	2.29	0.21	1.1	0.30	3.50
147	0.020	0.009					7.68	4.78	1.54	1.37	2.35	0.19	1.1	0.30	3.50
169	0.028	0.041					14.32	11.11	1.57	1.64	2.71	0.18	1.0	0.27	3.80
197	0.003	0.011					15.30	13.37	0.79	1.14	2.59	0.18	1.1	0.27	4.10
245	0.001	0.006					3.93	1.49	1.30	1.14	3.29	0.18	1.0	0.27	4.40
291	0.001	0.005					1.79	0.31	0.70	0.78	3.53	0.18	1.0	0.27	5.00
389	0.001	0.003					2.79	1.60	0.61	0.58	4.29	0.20	1.1	0.30	5.90

STN 3 BARTLETT 1309-80

BARTLETT 1309-80 Stn 4

DATE: 08/31/80 POSITION: 33.00N;18.00E BOTTOM DEPTH: 2090

DEPTH (m)	Poten Temp (deg C)	InSitu Temp (deg C)	CTD Salin (0/00)	Bottle Salin (0/00)	Sigma t	TSM (ug/L)	Nephels (arbit)	CH(4) (nl/L)	H(2) (nl/L)	N(2)O (nl/L)	O(2) (ml/L)	POC (ugC/L)	DOC (ugC/L)
1	26.695	26.695	38.257	38.232	25.28	44		61	14	181		3	681
10	26.631	26.634	38.307	38.329	25.34			53	13	199		7	824
19	26.629	26.634	38.419	38.423	25.42	34		55	16	212		15	537
28	25.245	25.252	38.185	38.123	25.68			58	10	209		9	523
39	20.811	20.319	38.161	38.039	26.96	47		80	9	234		7	635
50	19.858	19.868	38.153	38.116	27.21			72	13	206		8	495
58	18.775	18.786	38.063	38.056	27.42	81		64	6	255		14	587
66	17.983	18.000	38.007	38.045	27.58			58	8	224		9	746
84	16.959	16.974	38.069	38.038	27.88	38	2105	70	7	207		5	499
97	16.111	16.127	37.994	38.041	28.03	15	1939	68	9	230		2	514
112	15.940	15.959	38.039	38.056	28.10		1814	58	13	234		5	559
125	15.852	15.873	38.122	38.163	28.18		1529	57	8	238		9	561
143	15.527	15.551	38.274	38.319	28.38	31	1383	61	6	221			919
195	14.875	14.906	38.658	38.688	28.82	20	1255	65	23	220		6	435
292	14.271	14.317	38.812	38.822	29.07		1282	54	5	202		3	540
487	13.854	13.929	38.758	38.815	29.11	26	1160	28	8	239		6	349
723	13.622	13.735	38.717	38.756	29.12	31	1144	28	11	210		7	411
974	13.495	13.646	38.692	38.715	29.12	20	1003	25	9	239		5	379
1165	13.437	13.619	38.679	38.728	29.12		901	20	10	218		4	415
1456	13.381	13.610	38.665	38.684	29.11		945	18	8	226		0	397
1842	13.314	13.608	38.650	38.753	29.10		874	18	12	221		1	387
2038	13.284	13.611	38.642	38.702	29.09		893	14	11	210		2	309
2075	13.268	13.601	38.638	38.660	29.09		866	14	7	202		1	416
2085	13.268	13.602	38.638	38.658	29.09		808	15	20	242		2	400

STN 4 BARTLETT 1309-80

BARTLETT 1309-80 Stn 4

DATE: 08/31/80 POSITION: 33.00N;18.00E BOTTOM DEPTH: 2090

DEPTH (m)	Total Chloro ug/L	Total Phaeo ug/L	<20um Chloro ug/L	<20um Phaeo ug/L	>20um Chloro ug/L	>20um Phaeo ug/L	Total ATP ng/L	Micro ATP ng/L	Nano ATP ng/L	Pico ATP ng/L	NO(3) (ugA/L)	NO(2) (ugA/L)	NH(4) (ugA/L)	PO(4) (ugA/L)	SiO(4) (ugA/L)
1	0.026	0.004	0.007	0.005	0.019	0.000	28.42	12.72	5.16	10.54	0.66	0.18	1.1	0.36	1.90
10	0.010	0.002	0.006	0.005	0.003	0.000	17.86	8.15	5.10	4.60	0.66	0.19	1.1	0.39	2.20
19	0.021	0.002	0.013	0.006	0.008	0.000	24.54	18.03	2.69	3.83	0.66	0.19	1.1	0.36	2.20
28	0.026	0.011	0.026	0.008	0.001	0.003	15.58	6.25	4.31	5.01	0.66	0.21	1.2	0.33	2.20
39	0.032	0.008	0.028	0.008	0.004	0.000	14.49	5.06	4.52	4.91	0.72	0.19	1.1	0.33	2.20
50	0.034	0.012	0.038	0.009	0.000	0.003	14.12	4.84	3.94	5.34	0.79	0.22	1.3	0.33	2.20
58	0.027	0.019	0.025	0.010	0.002	0.008	31.70	22.20	4.85	4.65	0.59	0.18	1.1	0.33	1.90
66	0.027	0.018	0.039	0.016	0.000	0.002	20.08	12.70	3.78	3.61	0.66	0.18	1.1	0.33	2.20
84	0.095	0.042	0.055	0.042	0.040	0.000	12.32	5.55	2.85	3.91	0.66	0.18	1.2	0.33	2.20
97							7.66	1.59	1.95	4.12	0.72	0.19	1.2	0.31	2.20
112											0.72	0.20	1.2	0.23	2.20
125							3.99	1.41	1.16	1.42	0.79	0.22	1.3	0.31	2.20
143							5.54	0.00	2.22	3.45	1.38	0.21	1.2	0.31	2.50
195							7.60	3.36	1.49	2.75	3.16	0.21	1.1	0.31	3.10
292											4.80	0.17	1.0	0.31	5.00
487											5.33	0.16	1.0	0.31	5.60
728											5.59	0.16	1.0	0.31	7.80
974											5.66	0.16	1.1	0.33	8.80
1155											5.66	0.16	1.1	0.33	9.40
1456											5.53	0.16	1.1	0.33	9.40
1842											5.26	0.14	1.3	0.33	10.00
2038							1.25		0.30	1.10	5.26	0.14	1.3	0.33	10.30
2075							1.40	0.12	0.33	0.95	5.26	0.16	1.3	0.33	10.30
2085							0.95		0.44	0.71	5.26	0.18	1.3	0.33	10.30

STN 4 BARTLETT 1309-80

BARTLETT 1309-80 Stn 5

DATE: 09/02/80 POSITION: 36.49N;12.53E BOTTOM DEPTH: 1265

DEPTH (m)	Poten Temp (deg C)	InSitu Temp (deg C)	CTD Salin (0/00)	Bottle Salin (0/00)	Sigma t	TSM (ug/L)	Nephels (arbit)	CH(4) (nl/L)	H(2) (nl/L)	N(2)O (nl/L)	O(2) (ml/L)	POC (ugC/L)	DOC (ugC/L)
9	22.070	22.072	37.538	37.549	26.13	133	2511	46	9	310		15	1007
16	21.315	21.318	37.388	37.428	26.23		2894	63	15	258		12	780
19	20.949	20.953	37.365	37.298	26.31		2743	72	19	293		17	924
22	19.044	19.048	37.252	37.282	26.74	80	2594	79	10	216		12	837
29	18.276	18.281	37.272	37.291	26.95		2621	83	9	240		12	700
39	17.102	17.109	37.253	37.338	27.22		2478	83	6	210		12	676
48	16.238	16.246	37.356	37.416	27.51	45	2341	75	8	210		14	787
60	15.734	15.744	37.539	37.579	27.76		2567	85	10	270		15	707
68	15.563	15.574	37.721	37.621	27.94		2497	90	7	290		12	827
78	15.001	15.014	37.843	37.946	28.17	95	2493	119	12	286		12	741
100	14.716	14.732	38.236	38.314	28.53	55	1940	107	8	288		2	725
147	14.449	14.472	38.646	38.692	28.91		1472	55	10	291		7	928
194	14.344	14.374	38.764	38.768	29.02	38	1537	46	5	305		7	493
295	14.122	14.158	38.784		29.08		1856	44	4	310		3	433
439	13.930	14.043	38.774	38.793	29.10	45	1879	23	5	289		9	499
585	13.883	13.974	38.761	38.776	29.11	40	1817	25	5	328		7	614
782	13.819	13.941	38.748	38.770	29.10		1754	24	4	290		1	480
879	13.813	13.951	38.746	38.765	29.10	32	1746	21	6	282		5	527
935	13.811	13.958	38.746	38.764	29.10		1766	24	7	315		14	520
972	13.809	13.962	38.744	38.761	29.10		1784	26	7	272		3	791
1166	13.772	13.957	38.735		29.09		1668						
1229	13.771	13.966	38.736		29.09		1922						
1246	13.771	13.969	38.735	38.763	29.09		1836	21	5	287		8	722
1258	13.771	13.971	38.734	38.758	29.09	45	1844	21	4	295		5	358

STN 5 BARTLETT 1309-80

BARTLETT 1309-80 Stn 5

DATE: 03/02/80 POSITION: 36.49N;12.53E BOTTOM DEPTH: 1265

DEPTH (m)	Total Chloro ug/L	Total Phaeo ug/L	<20um Chloro ug/L	<20um Phaeo ug/L	>20um Chloro ug/L	>20um Phaeo ug/L	Total ATP ng/L	Micro ATP ng/L	Nano ATP ng/L	Pico ATP ng/L	NO(3) (ugA/L)	NO(2) (ugA/L)	NH(4) (ugA/L)	PO(4) (ugA/L)	SiO(4) (ugA/L)
9	0.021	0.006	0.018	0.005	0.003	0.001	20.07	10.95	5.19	3.93	0.45	0.16	1.6	0.31	2.30
16	0.030	0.007	0.036	0.010	0.000	0.000	34.05	21.24	4.91	7.90	0.51	0.20	1.6	0.23	2.60
19	0.036	0.013	0.034	0.011	0.002	0.002	21.26	7.91	7.57	5.78	0.51	0.14	1.3	0.25	2.30
22	0.041	0.017	0.034	0.018	0.007	0.000	27.23	10.11	8.49	8.63	0.51	0.15	1.4	0.23	2.60
29	0.069	0.021	0.060	0.021	0.009	0.000	32.40	15.28	8.93	8.14	0.51	0.14	1.4	0.28	2.30
39	0.086	0.032	0.099	0.035	0.000	0.000	36.88	21.25	6.99	8.64	0.58	0.15	1.4	0.25	2.30
48	0.125	0.054	0.119	0.039	0.006	0.016	42.06	21.98	11.00	9.09	0.58	0.15	1.3	0.31	2.30
60							43.15	23.82	10.69	8.64	0.58	0.16	1.3	0.25	2.60
69							50.52	37.33	6.25	6.95	0.64	0.17	1.5	0.25	2.00
78							18.87	10.41	4.75	3.72	1.03	0.26	1.4	0.25	2.60
100							9.75	3.98	2.91	2.87	2.05	0.21	1.5	0.28	2.90
147							17.94	15.17	1.51	1.25	3.59	0.22	1.5	0.31	4.20
194							1.62			1.11	4.23	0.22	1.8	0.34	4.60
295											4.87	0.20	1.6	0.37	5.90
439							2.33			0.75	5.19	0.19	1.5	0.39	6.50
585							1.99	0.00	0.77	1.36	5.32	0.18	1.5	0.39	6.50
782											5.32	0.17	1.5	0.42	6.80
879							0.55			0.44	5.38	0.16	1.3	0.42	6.90
935							3.78	1.57	1.04	1.17	5.38	0.16	1.4	0.42	5.80
972							2.98			2.24	5.45	0.15	1.4	0.42	7.20
1166															
1229															
1246							1.67			0.27	5.64	0.15	1.5	0.45	7.20
1258							1.47	0.48	0.64	0.36	5.64	0.15	1.5	0.45	7.20

STN 5 BARTLETT 1309-80

BARTLETT 1309-80 Stn 6

DATE: 09/04/80 POSITION: 39.22N;11.75E BOTTOM DEPTH: 3056

DEPTH (m)	Poten Temp (deg C)	InSitu Temp (deg C)	CTD Salin (0/00)	Bottle Salin (0/00)	Sigma t	TSM (ug/L)	Nephels (arbit)	CH(4) (nl/L)	H(2) (nl/L)	N(2)O (nl/L)	O(2) (ml/L)	POC (ugC/L)	DOC (ugC/L)
1	24.400	24.400	37.902	37.913	25.73			60	9	272		14	847
9	24.433	24.435	37.931	37.968	25.74			64	7	269		16	397
17	22.420	22.424	37.613	37.665	26.09			72	11	241		21	521
22	19.062	19.066	37.547	37.563	26.96		3085	74	8	247		23	628
30	17.005	17.010	37.571	37.536	27.49		2723	74	8	223		22	547
44	15.301	15.308	37.848	37.837	27.99		2816	85	10	262		17	592
58	14.856	14.865	37.984	37.982	28.31		2640	77	9	290		28	452
80	14.095	14.107	38.077	38.109	28.55		2789	81	12	311		26	414
88	13.946	13.959	38.136	38.154	28.62		2933	102	8	316		28	549
94	13.887	13.901	38.177	38.188	28.67		2280	72	16	304		16	450
98	13.893	13.908	38.199	38.230	28.68		2211	74	18	338		13	445
106	13.963	13.979	38.312	38.317	28.76		1745	84	20	303		7	414
121	13.956	13.975	38.387	38.418	28.82		1557	85	7	360		6	380
143	14.051	14.073	38.498	38.514	28.88		1482	62	4	334		7	817
172	14.033	14.059	38.556	38.586	28.93		1383	57	10	396		4	384
195	14.006	14.036	38.586	38.608	28.96		1390	56	11	334		6	347
391	13.974	14.035	38.692	38.706	29.04		1136	46	11	331		3	295
779	13.383	13.502	38.570	38.591	29.05		961	35	10	291		3	274
1166	13.073	13.252	38.492	38.529	29.05		993	29	12	303		7	273
1553	12.893	13.138	38.443	38.473	29.04		930	28	9	327		7	294
1942	12.819	13.122	38.418	38.478	29.02		904	28	10	314		4	286
2329	12.803	13.172	38.415	38.479	29.01		894	28	12	336		0	228
2713	12.794	13.231	38.406	38.452	28.99		956	24	10	369		1	319
2751	12.792	13.236	38.405	38.468	28.99		922	18	6	391		2	235

STN 6 BARTLETT 1309-80

BARTLETT 1309-80 Stn 6

DATE: 09/04/80 POSITION: 39.22N;11.75E BOTTOM DEPTH: 3056

DEPTH (m)	Total Chloro ug/L	Total Phaeo ug/L	<20um Chloro ug/L	<20um Phaeo ug/L	>20um Chloro ug/L	>20um Phaeo ug/L	Total ATP ng/L	Micro ATP ng/L	Nano ATP ng/L	Pico ATP ng/L	NO(3) (ugA/L)	NO(2) (ugA/L)	NH(4) (ugA/L)	PO(4) (ugA/L)	SiO(4) (ugA/L)
1							17.26	9.42	2.89	4.95	0.69	0.38	1.6	0.26	2.00
9							10.22	3.44	2.10	4.68	0.75	0.42	1.6	0.24	2.00
17							22.93	7.32	6.62	9.00	0.75	0.45	1.8	0.24	2.00
22							41.40	31.88	4.44	5.08	0.75	0.46	1.8	0.26	2.00
39							18.89	2.05	9.27	7.57	0.81	0.44	1.7	0.25	2.30
44	0.108	0.016	0.117	0.037	0.000	0.000	16.07	3.25	7.36	5.45	0.88	0.45	1.6	0.29	2.30
58	0.130	0.035	0.136	0.035	0.000	0.000	14.04	5.63	4.10	4.31	0.94	0.45	1.6	0.29	2.70
80	0.262	0.215	0.369	0.212	0.000	0.004	13.94	5.90	2.59	5.36	1.00	0.44	1.6	0.29	2.70
88	0.678	0.366	0.363	0.218	0.316	0.036	22.22	12.95	4.99	4.29	1.63	0.45	1.5	0.32	3.00
94	0.142	0.177	0.172	0.195	0.000	0.000	16.92	8.42	4.63	3.87	2.31	0.38	1.6	0.32	3.30
98	0.102	0.126	0.104	0.150	0.000	0.000	12.43	6.99	2.25	3.19	3.13	0.43	1.6	0.32	3.70
106	0.072	0.112	0.038	0.093	0.034	0.019	22.15	15.61	3.27	3.27	4.25	0.41	1.6	0.32	4.00
121							3.29	0.66	1.14	1.49	5.50	0.39	1.7	0.34	5.00
143							5.27			2.23	6.13	0.39	1.9	0.34	5.30
172							3.25			2.14	6.00	0.28	1.4	0.34	5.70
195							0.90		0.38	0.65	6.05	0.26	1.3	0.37	6.00
391							3.47			0.65	6.25	0.25	1.3	0.37	7.00
779							3.60			3.26	7.75	0.28	1.4	0.39	9.30
1166							0.45			0.30	8.56	0.29	1.4	0.42	10.70
1553							0.89	0.08	0.08	0.72	8.94	0.27	1.4	0.45	11.70
1942							3.16			2.71	9.19	0.28	1.4	0.45	11.70
2329							1.33			0.93	8.94	0.14	1.1	0.47	11.70
2713							3.13			2.69	8.88	0.15	1.1	0.47	11.70
2751							5.37	0.17	0.70	4.49	8.94	0.19	1.1	0.47	11.70

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STN 6 BARTLETT 1309-80

BARTLETT 1309-80 Stn 7

DATE: 09/05/80 POSITION: 37.93N;3.38E BOTTOM DEPTH: 2354m

DEPTH (m)	Poten Temp (deg C)	InSitu Temp (deg C)	CTD Salin (0/00)	Bottle Salin (0/00)	Sigma t	TSM (ug/L)	Nephels (arbit)	CH(4) (nl/L)	H(2) (nl/L)	N(2)O (nl/L)	O(2) (ml/L)	POC (ugC/L)	DOC (ugC/L)
2	24.638	24.639	37.230	37.272	25.14		2540	81	21			21	958
5	24.630	24.631	37.231	37.241	25.15	55	2540	73	18	330		20	1534
13	24.634	24.637	37.231	37.237	25.15	49	2447	59	7	159		17	845
20	24.148	24.153	37.244	37.241	25.30	92	2357	46	11	167		17	903
33	21.304	21.311	37.470	37.297	26.29		2282	59	14	202		18	744
48	17.971	17.980	37.056	37.125	26.86	155	2405	62	8	198		14	740
67	15.893	15.904	37.262	37.312	27.51		2467	73	5	272		16	780
83	14.890	14.903	37.517	37.572	27.94		1595	88	11	268		7	
101	14.323	14.339	37.698	37.763	28.20	35	2109	84	7	209		9	679
134	13.934	13.954	38.038	38.123	28.59		1397	77	6	320		7	789
141	13.796	13.817	38.111	38.148	28.64	20	1481	83	7	352		3	567
170	13.630	13.656	38.218	38.258	28.75		1475	88	5	334		8	1355
196	13.695	13.725	38.368	38.380	28.85	29	1405	70	4	360		8	584
342	13.938	13.991	38.642	38.564	29.01	22	1184	46	4	345		3	795
514	13.458	13.536	38.570	38.536	29.05	43	1407	26	6	356		9	741
683	13.152	13.255	38.504	38.527	29.05	21	1221	27	7	328		8	493
973	12.868	13.014	38.431	38.454	29.05		1251	29	18	356		5	862
1215	12.816	13.000	38.419	38.479	29.05		1125	25	15	352		8	577
1287	12.802	12.997	38.414	38.467	29.04		1325	24	10	352			556
1360	12.791	12.998	38.413	38.466	29.04		1352	37	7	360		10	426
1941	12.747	13.049	38.400	38.458	29.02		1179	31	5	386		4	470
2134	12.739	13.074	38.398	38.457	29.02		1156	31	15	419		6	635
2177	12.739	13.081	38.397	38.430	29.01		1114	33	13	428		2	489
2214	12.738	13.087	38.397	38.435	29.01		1160	20	6	410		4	366

STN 7 BARTLETT 1309-80

BARTLETT 1309-80 Stn 7

DATE: 09/05/80 POSITION: 37.93N;8.38E BOTTOM DEPTH: 2354m

DEPTH (m)	Total Chloro ug/L	Total Phaeo ug/L	<20um Chloro ug/L	<20um Phaeo ug/L	>20um Chloro ug/L	>20um Phaeo ug/L	Total ATP ng/L	Micro ATP ng/L	Nano ATP ng/L	Pico ATP ng/L	NO(3) (ugA/L)	NO(2) (ugA/L)	NH(4) (ugA/L)	PO(4) (ugA/L)	SiO(4) (ugA/L)
2	0.019	0.005	0.010	0.005	0.009	0.001	22.77	13.24	4.44	5.09	0.63	0.17	1.5	0.25	2.00
5	0.021	0.010	0.015	0.008	0.006	0.002	18.02	1.67	9.03	7.31	0.63	0.17	1.3	0.29	2.00
13	0.025	0.012	0.019	0.009	0.007	0.003	32.10	17.75	3.05	6.30	0.51	0.14	1.4	0.29	2.30
20	0.038	0.011	0.019	0.016	0.019	0.000	21.48	10.07	7.38	4.03	0.57	0.13	1.4	0.25	2.30
33	0.052	0.013	0.043	0.016	0.009	0.000	21.34	5.67	11.23	4.94	0.57	0.15	1.3	0.25	2.60
49	0.072	0.033	0.070	0.042	0.002	0.000	15.59	1.98	7.32	5.89	0.57	0.16	1.2	0.25	2.30
67	0.166	0.097	0.161	0.086	0.004	0.011	22.47	8.03	7.30	7.14	0.63	0.15	1.4	0.24	2.00
83	0.091	0.068	0.062	0.054	0.029	0.014	15.17	8.93	3.35	2.89	1.58	0.16	1.5	0.29	2.30
101	0.127	0.137	0.174	0.161		0.000	19.36	9.89	4.61	4.86	1.33	0.18	1.5	0.24	2.60
134	0.048	0.061	0.052	0.058		0.003	12.87	6.90	3.47	2.50	1.52	0.24	1.5	0.24	2.60
141					0.000		9.20	2.01	3.35	3.84	1.46	0.20	1.3	0.24	3.00
170					0.000		10.74	7.41	1.18	2.15	3.16	0.17	1.4	0.24	3.30
196							18.24			2.30	5.32	0.32	1.8	0.31	4.90
342							1.64			0.73	6.34	0.33	1.8	0.33	5.20
514							4.33			3.21	8.42	0.17	1.3	0.38	8.20
683							1.56	0.16	0.42	0.97	8.80	0.16	1.3	0.43	8.90
973							18.10			16.75	9.18	0.16	1.3	0.48	9.50
1215							7.49			6.74	9.18	0.17	1.4	0.50	9.20
1287										0.37	9.18	0.17	1.4	0.50	9.30
1360							2.14			1.77	9.18	0.19	1.4	0.50	9.80
1941							1.05			0.71	9.18	0.19	1.4	0.50	10.50
2134							8.02			7.78	9.11	0.19	1.4	0.50	10.20
2177							3.95			3.63	9.11	0.19	1.4	0.50	10.20
2214							2.46	0.00	0.88	2.01	9.05	0.18	1.4	0.50	10.50

STN 7 BARTLETT 1309-80

BARTLETT 1309-80 Stn 8

DATE: 09/07/80 POSITION: 41.00N;6.49E BOTTOM DEPTH: 2606m

DEPTH (m)	Poten Temp (deg C)	Insitu Temp (deg C)	CTD Salin (0/00)	Bottle Salin (0/00)	Sigma t	TSM (ug/L)	Nephels (arbit)	CH(4) (nl/L)	H(2) (nl/L)	N(2)O (nl/L)	O(2) (ml/L)	POC (ugC/L)	DOC (ugC/L)
1	21.541	21.541	38.037	38.058	26.66			49	10	292	5.28	16	919
11	21.405	21.409	38.120	38.127	26.76			50	23	309	5.30	11	1073
17	21.390	21.394	38.118	38.125	26.77			69	12	304	5.31	15	719
19	21.199	21.203	38.083	38.126	26.79			64	16	244	5.35	10	850
24	21.022	21.027	39.134	38.146	26.88			65	9	219	5.35	10	577
29	20.119	20.125	38.143	38.116	27.13			68	7	225	5.48	16	660
36	19.018	19.025	38.074	38.085	27.37			78	6	257	5.90	14	538
42	17.036	17.043	38.096	38.018	27.88			84	6	286	6.24	12	556
47	15.379	15.387	38.034	38.019	28.27			88	4	285	6.35	14	593
67	13.680	13.690	38.043	38.042	28.61			86	5	296	5.86	17	591
97	13.075	13.089	38.140	38.149	28.81		1788	85		299		10	377
150	12.941	12.963	38.244	38.277	28.92		1130	72	5	295		3	354
160	13.242	13.266	38.411	38.410	28.99		1186	59	7	302		3	374
187	13.331	13.359	38.423	38.229	28.98		1113	65	6	302		5	320
219	13.197	13.230	38.440	38.454	29.02		1076	70	4	261		5	433
291	13.361	13.405	38.519	38.533	29.04		1038	42	8	272		4	479
387	13.231	13.339	13.519	38.534	9.76		967	44	5	310			249
487	13.209	13.273	38.509	38.541	29.06		1051	38	7	268		4	264
729	13.030	13.139	38.473	38.500	29.06		994	34	11	263		4	595
974	12.899	13.046	38.442	38.479	29.06		942	28	9	306		2	352
1263	12.825	13.017	38.421	38.465	29.05		962	25	8	326		2	382
1553	12.778	13.016	38.409	38.437	29.04		892	26	9	307		3	393
1943	12.746	13.049	38.401	38.455	29.02		825	26	5	302		3	355
2328	12.740	13.108	38.397	38.456	29.01		786	22		290		5	329

STN 8 BARTLETT 1309-80

BARTLETT 1309-80 Stn 8

DATE: 09/07/80 POSITION: 41.00N;6.49E BOTTOM DEPTH: 2606m

DEPTH (m)	Total Chloro ug/L	Total Phaeo ug/L	<20um Chloro ug/L	<20um Phaeo ug/L	>20um Chloro ug/L	>20um Phaeo ug/L	Total ATP ng/L	Micro ATP ng/L	Nano ATP ng/L	Pico ATP ng/L	NO(3) (ugA/L)	NO(2) (ugA/L)	NH(4) (ugA/L)	PO(4) (ugA/L)	SiO(4) (ugA/L)
1	0.007	0.005	0.027	0.004	0.000	0.001	9.57	1.12	4.22	4.23	0.64	0.24	1.6	0.31	1.90
11	0.030	0.005	0.018	0.005	0.012	0.000	13.66	3.50	3.36	6.79	0.64	0.25	1.6	0.33	2.20
17	0.034	0.004	0.017	0.004	0.016	0.000	14.26	5.59	2.82	5.84	0.58	0.19	1.4	0.31	1.90
19	0.027	0.010	0.026	0.006	0.001	0.004	13.89	4.08	3.10	6.72	0.64	0.21	1.4	0.23	1.90
24	0.022	0.009	0.037	0.004	0.000	0.004	10.50	1.44	2.90	6.16	0.64	0.18	1.4	0.28	1.60
29	0.040	0.013	0.036	0.011	0.004	0.002	11.10	1.98	3.74	5.38	0.64	0.18	1.3	0.25	1.90
36	0.081	0.026	0.048	0.021	0.032	0.005	12.33	4.08	2.91	5.34	0.71	0.20	1.4	0.23	1.90
42	0.043	0.029	0.060	0.030	0.000	0.000	12.99	4.29	3.59	5.00	0.71	0.21	1.4	0.28	1.60
47	0.085	0.032	0.055	0.034	0.030	0.000	9.68	3.24	2.84	3.61	0.77	0.23	1.4	0.25	1.60
67	0.102	0.108	0.087	0.075	0.015	0.033	7.90	1.38	3.27	3.24	0.77	0.22	1.4	0.28	1.60
97	0.079	0.092	0.070	0.074	0.008	0.018	6.13	1.90	1.89	2.33	3.01	0.32	1.5	0.31	2.50
150	0.008	0.013	0.008	0.011	0.000	0.002	2.97	0.58	1.12	1.27	5.77	0.24	1.4	0.33	3.30
160							5.39			0.93	6.99	0.14	1.2	0.36	4.30
187							2.04			0.80	7.76	0.15	1.3	0.39	5.40
219							6.04			4.12	7.44	0.16	1.3	0.42	5.40
291							2.50	0.36	0.35	1.29	8.33	0.16	1.3	0.44	6.30
387							7.66			6.39	8.59	0.17	1.3	0.42	7.00
487							6.27			4.73	8.97	0.17	1.4	0.42	7.90
729							1.92			1.15	9.23	0.14	1.4	0.42	8.90
974							3.56	1.35	0.29	1.92	9.30	0.14	1.3	0.44	9.20
1263							0.79			0.55	9.30	0.14	1.3	0.44	9.50
1553							5.02			4.62	9.42	0.14	1.4	0.47	9.50
1943							2.64			1.54	8.97	0.14	1.4	0.47	9.80
2328							7.30			6.98	9.36	0.14	1.5	0.47	10.50

STN 8 BARTLETT 1309-80

BARTLETT 1309-80 Stn 9

DATE: 09/09/80 POSITION: 38.33N;4.99E BOTTOM DEPTH: 2600m

PRESS (db)	Poten Temp (deg C)	Insitu Temp (deg C)	CTD Salin (0/00)	Bottle Salin (0/00)	Sigma t	TSM (ug/L)	Nepnels (arbit)	CH(4) (nl/L)	H(2) (nl/L)	N(2)O (nl/L)	O(2) (ml/L)	POC (ugC/L)	DOC (ugC/L)
6	24.253	24.254	37.441	37.446	25.42			50	27	290	5.01	20	478
11	24.236	24.238	37.464	37.496	25.44	106		56	22	259	4.98	20	535
17	24.310	24.314	37.548	37.552	25.48			56	21	270	5.02	15	470
20	24.320	24.324	37.557	37.567	25.49			58	17	315	5.01	21	528
24	24.297	24.302	37.569	37.532	25.50	54		64	13	310	5.25	20	473
33	21.927	21.934	37.377	37.312	26.05			79	9	302	5.85	25	506
42	18.788	18.796	37.319	37.326	26.85	47		85	6	284	6.07	18	704
50	17.688	17.697	37.371	37.389	27.17			81	4	325	6.20	18	612
61	15.843	15.853	37.244	37.295	27.51			91	6	325	6.06	15	571
81	14.820	14.832	37.653	37.676	28.06	95		92	9	310	5.81	15	359
99	14.041	14.056	37.767	37.870	28.33	52		80	9	302	5.49	14	399
126	13.620	13.638	37.992	38.018	28.58	29		83	7	298	5.40	24	352
154	13.409	13.431	38.055	38.259	28.67	18	933	82	14	274	4.93	6	348
202	13.223	13.252	38.214	38.498	28.84	13	819	55	9	323	4.26	3	298
300	13.392	13.436	38.451	38.564	28.98		870	53	9	310	4.15	3	359
402	13.445	13.504	38.520	38.529	29.02	19	900	44	9	297	4.26	3	416
601	13.160	13.268	38.490	38.503	29.05		893	34	5	276	4.33	5	710
776	13.024	13.137	38.453	38.495	29.05	19	766	29	8	310	4.42	6	642
953	12.922	13.061	38.426	38.461	29.04	21	802	22	9	306	4.52		415
1201	12.835	13.012	38.412	38.452	29.04		788	26	7	370	4.61	5	588
1576	12.775	13.010	38.395	38.451	29.03	22	663	28	10	346	4.63	5	381
1998	12.746	13.048	38.366	38.443	29.01		651	27	10	341	4.61	7	496
2299	12.737	13.088	38.383	38.453	29.00		697	24	8	258	4.58	8	503
2423	12.737	13.109	38.377	38.462	28.99		679	28	11	274	4.59	12	371

STN 9 BARTLETT 1309-80

BARTLETT 1309-80 Stn 9

DATE: 09/09/80 POSITION: 38.33N;4.99E BOTTOM DEPTH: 2600m

DEPTH (m)	Total Chloro ug/L	Total Phaeo ug/L	<20um Chloro ug/L	<20um Phaeo ug/L	>20um Chloro ug/L	>20um Phaeo ug/L	Total ATP ng/L	Micro ATP ng/L	Nano ATP ng/L	Pico ATP ng/L	NO(3) (ugA/L)	NO(2) (ugA/L)	NH(4) (ugA/L)	PO(4) (ugA/L)	SiO(4) (ugA/L)
5	0.010	0.004	0.006	0.005	0.004	0.000	16.96	6.49	5.95	4.52	0.50	0.14	1.5	0.29	2.00
10	0.017	0.005	0.013	0.005	0.003	0.000	17.66	9.11	8.13	9.42	0.56	0.15	1.6	0.29	2.00
16	0.023	0.004	0.010	0.006	0.013	0.000	16.42	3.79	4.03	7.70	0.50	0.13	1.4	0.27	2.00
19	0.018	0.007	0.021	0.005	0.000	0.001	14.22	4.34	4.11	5.27	0.50	0.14	1.4	0.27	1.60
22	0.030	0.007	0.018	0.008	0.013	0.000	9.94	2.64	3.62	3.68	0.50	0.15	1.4	0.27	2.00
31	0.052	0.014	0.034	0.018	0.017	0.000	34.99	20.34	5.31	8.34	0.56	0.14	1.4	0.27	2.00
40	0.055	0.022	0.040	0.022	0.026	0.000	17.33	4.37	6.21	6.75	0.53	0.17	1.5	0.27	2.00
43	0.077	0.041	0.087	0.034	0.000	0.007	19.40	6.74	6.52	6.13	0.63	0.17	0.5	0.29	2.00
58	0.110	0.065	0.102	0.053	0.008	0.011	12.23	2.81	5.19	4.24	0.56	0.20	1.6	0.27	2.00
73	0.253	0.180	0.133	0.162	0.115	0.019	13.96	6.46	3.27	4.24	0.69	0.25	1.7	0.29	2.30
96	0.106	0.139	0.102	0.134	0.004	0.005	12.07	6.17	2.73	3.16	1.38	0.27	1.8	0.27	2.50
122	0.057	0.080	0.051	0.100	0.006	0.000	12.10	7.21	1.74	3.15	1.44	0.23	1.6	0.27	2.60
149							5.41			2.74	5.56	0.23	1.5	0.32	3.90
196							4.11			1.77	8.38	0.22	1.5	0.40	5.20
291							2.56			1.04	8.69	0.19	1.1	0.45	7.20
391							2.75	0.07	0.51	2.18	9.06	0.19	1.2	0.48	8.50
585							5.38			4.49	9.06	0.19	1.2	0.51	9.20
755							3.14			2.64	9.00	0.19	1.2	0.53	9.50
927							1.88			1.52	8.94	0.19	1.2	0.53	9.80
1167							0.86	0.00	0.25	0.61	8.81	0.19	1.2	0.53	10.20
1531							1.60			1.27	8.38	0.18	1.1	0.56	10.50
1939							2.72			1.75	8.94	0.18	1.1	0.56	10.30
2230							1.95			1.49	8.31	0.19	1.1	0.56	10.80
2349											8.88	0.18	1.2	0.59	10.80

STN 9 BARTLETT 1309-80

BARTLETT 1309-80 Stn 10

DATE: 09/10/80 POSITION: 36.93N;00.01W BOTTOM DEPTH: 2570m

DEPTH (m)	Poten Temp (deg C)	InSitu Temp (deg C)	CTD Salin (0/00)	Bottle Salin (0/00)	Sigma t	TSM (ug/L)	Nephels (arbit)	CH(4) (nl/L)	H(2) (nl/L)	N(2)O (nl/L)	O(2) (ml/L)	POC (ugC/L)	DOC (ugC/L)
4	23.661	23.662	37.100	37.124	25.34		2997	54	27	265	5.05	23	631
13	23.560	23.663	37.101	37.117	25.34	57	3025	51	33	251	5.07	30	590
21	23.589	23.594	37.036	37.127	25.36		3110	59	37	252	5.18	24	642
22	23.078	23.083	37.124	37.180	25.53		3244	74	19	250	5.97	30	617
27	19.199	19.204	37.183	37.374	26.64	56	3278	85	19	269	6.37	27	666
34	17.708	17.714	37.531	37.606	27.29		3176	87	17	283	6.64	41	688
38	16.249	16.256	37.540	37.660	27.65		3064	39	8	243	6.33	21	712
50	14.978	14.986	37.693	37.744	28.05	46	2971	95	9	251	6.02	20	605
59	14.496	14.505	37.374	37.393	28.30	35	2675	108	6	295	5.90	23	547
78	13.683	13.695	37.999	38.077	28.58	20	2657	100	5	307	5.53	26	484
96	13.353	13.367	38.100	38.147	28.72	26	1896	95	9	330	4.85	9	418
122	13.177	13.195	38.171	38.227	28.81		1688	75	10	299	4.91	12	649
149	13.112	13.134	38.225	38.268	28.87	18	1579	91	28	308	4.87	10	590
200	13.265	13.295	38.374	38.408	28.95		1632	67	20	309	4.73	9	369
392	13.291	13.350	38.507	38.547	29.04	20	1695	52	23	290	4.36	8	429
586	13.104	13.192	38.475	38.248	29.05	32	1593	50	36	235	4.40	3	331
784	12.973	13.090	38.449	38.490	29.05		1488	44	31	311	4.42	11	299
976	12.982	13.029	38.427	38.474	29.05	21	1435	43	30	310	4.44	8	429
1215	12.817	13.001	38.406	38.455	29.04	15	1395	29	6	301	4.51	9	374
1460	12.779	13.002	38.397	38.466	29.03	11	1272	26	11	311	4.56	9	473
1694	12.759	13.020	38.396	38.443	29.03		1378	28	8	238	4.34	6	333
1940	12.744	13.046	38.336	38.452	29.01		1340	24	14	349	4.57	6	347
2136	12.738	13.073	38.383	38.472	29.00		1341	24	12	342	4.57	10	644
2287	12.737	13.098	38.386	38.473	29.00		1325	28	11	332	4.58	17	352

STN 10 BARTLETT 1309-80

BARTLETT 1309-80 Stn 10

DATE: 09/10/80 POSITION: 36.93N;00.01W BOTTOM DEPTH: 2570m

DEPTH (m)	Total Chloro ug/L	Total Phaeo ug/L	<20um Chloro ug/L	<20um Phaeo ug/L	>20um Chloro ug/L	>20um Phaeo ug/L	Total ATP ng/L	Micro ATP ng/L	Nano ATP ng/L	Pico ATP ng/L	NO(3) (ugA/L)	NO(2) (ugA/L)	NH(4) (ugA/L)	PO(4) (ugA/L)	SiO(4) (ugA/L)
4	0.056	0.028	0.015	0.014	0.041	0.014	21.29	11.51	5.53	4.25	0.50	0.14	1.2	0.36	2.70
13	0.047	0.017	0.064	0.011	0.000	0.006	17.94	7.45	4.92	5.57	0.50	0.18	1.2	0.33	2.30
21	0.035	0.024	0.073	0.017	0.011	0.007	31.70	21.36	3.25	6.59	0.50	0.17	1.2	0.33	2.70
22	0.089	0.025	0.054	0.019	0.035	0.006	42.27	30.93	5.94	5.40	0.50	0.19	1.2	0.33	2.70
27	0.078	0.021	0.074	0.020	0.004	0.001	25.81	15.60	5.15	5.06	0.50	0.17	1.3	0.36	2.70
34	0.093	0.035	0.070	0.030	0.028	0.005	15.75	7.17	3.83	4.74	0.50	0.17	1.3	0.33	2.70
38	0.104	0.032	0.072	0.038	0.032	0.000	27.10	17.99	3.97	5.14	0.50	0.18	1.4	0.33	2.30
50	0.170	0.058	0.127	0.065	0.042	0.000	31.19	21.72	3.95	5.52	0.44	0.16	1.2	0.25	2.30
59	0.195	0.056	0.123	0.059	0.072	0.000	12.20	5.08	3.79	3.32	0.50	0.16	1.2	0.30	2.70
78	0.176	0.145	0.161	0.125	0.015	0.020	12.38	6.28	3.08	3.01	1.25	0.25	1.2	0.33	2.30
96	0.064	0.059	0.045	0.030	0.019	0.029	5.95	2.78	1.58	1.59	4.94	0.14	1.2	0.33	4.00
122	0.012	0.022	0.011	0.017	0.000	0.005	10.17	5.65	0.75	3.77	5.31	0.15	1.1	0.33	4.70
149							5.91			1.56	5.69	0.14	1.1	0.38	5.00
200							3.29			1.35	7.06	0.14	1.1	0.41	6.00
392							4.04			2.45	8.50	0.14	0.9	0.47	8.30
586							1.39	0.44	0.40	1.06	8.75	0.14	1.0	0.52	9.00
784							4.51			2.46	9.00	0.14	0.9	0.55	9.70
976							2.89			2.37	9.00	0.14	0.9	0.53	10.00
1215							2.67			2.29	9.00	0.14	1.0	0.55	10.00
1460							1.14	0.20	0.20	0.74	8.88	0.13	1.0	0.58	10.30
1694							1.51			1.24	8.88	0.13	1.0	0.59	10.70
1940							1.44			1.12	8.94	0.14	1.1	0.55	11.00
2136							2.27			1.60	8.94	0.14	1.1	0.55	11.30
2287							2.30	0.62	0.35	1.33	8.94	0.14	1.1	0.55	11.70

STN 10 BARTLETT 1309-80

BARTLETT 1309-80 Stn 11

DATE: 09/11/80 POSITION: 36.10N;4.29W BOTTOM DEPTH: 1250

DEPTH (m)	Poten Temp (deg C)	InSitu Temp (deg C)	CTD Salin (0/00)	Bottle Salin (0/00)	Sigma t	TSM (ug/L)	Nephels (arbit)	CH(4) (nl/L)	H(2) (nl/L)	N(2)O (nl/L)	O(2) (ml/L)	POC (ugC/L)	DOC (ugC/L)
1	23.880	23.880	36.485	36.418	24.81		1626	61	34	259	5.66	31	677
11	21.646	21.648	36.311	36.355	25.32		2069	68	26	283		47	609
21	19.659	19.663	36.309	36.327	25.85		2430	73	24	287	5.87	42	812
31	19.120	19.126	36.409	36.311	26.07		2354	74	6	304	5.72	44	625
39	17.866	17.873	36.294	36.300	26.30		2398	62	9	305	5.45	27	594
51	17.357	17.366	36.294	36.247	26.42		2093	61	12	336	5.24	16	728
64	16.826	16.837	36.293		26.55		1675	81	4	338	4.99	15	650
75	16.218	16.231	36.324	36.587	26.72		1198	78	5	328	5.07	9	616
98	15.245	15.261	36.529	36.916	27.10		1650	74	9	407	4.75	9	668
119	14.622	14.641	36.847	37.584	27.48		1493	75	11	433	4.47	22	582
138	14.029	14.050	37.442	38.133	28.07		2266	87	16	440	4.59	12	636
162	13.337	13.361	38.068	38.120	28.70		1523	89	11	432	4.61	18	528
197	13.156	13.185	38.233	38.279	28.86		2719	73	30	391	4.44	7	342
293	13.175	13.219	38.415	38.443	29.00		2731	51	42	367	4.03	5	331
389	13.182	13.240	38.463	38.491	29.03		2569	41	22	332	4.05	6	322
490	13.108	13.181	38.464	38.494	29.04		2175	41	4	336	4.19	5	258
970	12.863	13.009	38.419	38.456	29.05		1750	42	6	344	4.48	4	299
1166	12.807	12.983	38.406	38.444	29.04		1889	43	5	358	4.51	7	414
1201	12.797	12.979	38.404	38.437	29.04		2223	46	10	360	4.47	4	240
1221	12.793	12.977	38.402	38.198	29.04		3060	58	6	395	4.42	7	546
1246	12.792	12.981	38.401	38.464	29.04		3315	51	5	400	4.43	12	452

STN 11 BARTLETT 1309-80

BARTLETT 1309-80 Stn 11

DATE: 09/11/80 POSITION: 36.10N;4.29W BOTTOM DEPTH: 1250

DEPTH (m)	Total Chloro ug/L	Total Phaeo ug/L	<20um Chloro ug/L	<20um Phaeo ug/L	>20um Chloro ug/L	>20um Phaeo ug/L	Total ATP ng/L	Micro ATP ng/L	Nano ATP ng/L	Pico ATP ng/L	NO(3) (ugA/L)	NO(2) (ugA/L)	NH(4) (ugA/L)	PO(4) (ugA/L)	SiO(4) (ugA/L)
1	0.088	0.029	0.036	0.019	0.052	0.010	45.50	25.96	7.54	12.00	0.49	0.15	1.3	0.33	1.30
11	0.159	0.029	0.064	0.037	0.096	0.000	51.16	21.92	10.16	19.08	0.43	0.16	1.2	0.33	1.30
21	0.276	0.091	0.174	0.071	0.102	0.021	56.55	32.55	13.49	10.51	0.43	0.15	1.2	0.30	1.60
31	0.349	0.182	0.222	0.110	0.128	0.071	68.92	45.42	10.92	12.58	0.49	0.20	1.1	0.30	1.90
39	0.497	0.181	0.390	0.178	0.107	0.003	86.39	68.86	9.85	7.67	1.05	0.50	1.2	0.33	2.30
51	0.222	0.083	0.144	0.090	0.077	0.000	25.37	10.40	9.73	5.25	2.65	0.31	1.0	0.36	2.60
64	0.096	0.084	0.072	0.068	0.023	0.016	14.57	2.61	6.70	5.26	6.73	0.18	1.2	0.38	4.80
75	0.072	0.068	0.068	0.063	0.004	0.005	11.58	4.33	3.27	3.98	5.37	0.19	1.1	0.41	3.90
98	0.044	0.053	0.030	0.044	0.015	0.009	8.84	1.51	4.49	2.84	6.00	0.17	1.1	0.44	5.20
119	0.166	0.136	0.102	0.108	0.064	0.028	21.83	10.34	6.71	4.78	7.59	0.20	1.0	0.47	6.10
136	0.011	0.069	0.032	0.060	0.000	0.010	11.40	5.07	3.87	2.46	6.42	0.16	1.1	0.47	4.80
162	0.019	0.067	0.017	0.054	0.003	0.013	11.87	1.72	4.88	5.27	6.48	0.16	1.2	0.44	4.80
197							10.98	6.80	2.48	1.69	7.78	0.18	1.3	0.47	5.80
293							9.85			3.62	9.88	0.19	1.4	0.49	8.10
389							3.88			2.20	9.94	0.24	1.6	0.52	8.70
490							6.24			1.63	9.51	0.21	1.5	0.55	9.40
970							1.93	0.37	0.36	1.19	9.07	0.20	1.6	0.55	10.00
1166							2.56			2.20	9.07	0.18	1.5	0.55	11.30
1201							2.48	0.22	0.46	1.81	9.07	0.18	1.4	0.55	12.30
1221							5.38	0.44	0.53	4.42	9.07	0.17	1.3	0.58	12.90
1246							17.82	0.41	1.19	16.21	9.07	0.14	1.2	0.55	12.90

STN 11 BARTLETT 1309-80

BARTLETT 1309-80 Stn 12

DATE: 09/13/80 POSITION: 35.62N;7.7W BOTTOM DEPTH: 1400m

DEPTH (m)	Poten Temp (deg C)	In3itu Temp (deg C)	CTD Salin (0/00)	Bottle Salin (0/00)	Sigma t	TSM (ug/L)	Nephels (arbit)	CH(4) (nl/L)	H(2) (nl/L)	N(2)O (nl/L)	O(2) (ml/L)	POC (ugC/L)	DOC (ugC/L)
4	23.470	23.471	36.572	36.602	24.99	27	2688	46	15	195	5.08	20	802
12	23.420	23.423	36.566	36.595	25.00		2668	47	14	212	5.12	19	741
19	22.076	22.080	35.666	36.548	25.47	37	2776	49	11	218	5.56	27	581
22	20.593	20.598	36.456	36.470	25.72		2309	52	10	236	5.82	25	699
29	19.604	19.610	36.457	36.463	25.93		2749	57	11	253	5.95	32	714
33	19.249	19.255	36.397	36.453	26.03		2853	61	12	234	6.11	34	735
39	18.309	18.316	36.425	36.449	26.29		2858	56	10	253	6.11	18	715
47	17.634	17.642	36.399	36.446	26.44		2949	59	5	251	5.33	24	622
61	16.921	16.932	36.372	36.407	26.59	36	2694	60	3	259	5.67	24	619
77	16.615	16.628	36.346	36.366	26.64		2493	59	8	273	5.45	8	307
96	16.183	16.199	36.292	36.281	26.70	26	2240	51	2	289	5.27	15	430
121	15.820	15.340	36.232	36.237	26.74		1823	51	5	236	5.25	13	467
146	15.700	15.724	36.212	36.233	26.75		1620	52	5	272	5.20	9	449
191	14.617	14.647	36.032	36.038	26.85		1434	53	3	266	5.07	10	415
290	13.096	13.133	35.769	35.805	26.96		1424	48	5	314	4.87	12	438
485	11.570	11.635	35.597	35.633	27.12	11	1325	53	8	333	4.73	16	414
683	10.788	10.877	35.670	35.709	27.32		1269	43	12	522	4.19	10	433
874	10.319	10.431	35.836	35.879	27.53		1201	40	15	420	4.16	9	507
1068	10.044	10.130	35.978	36.024	27.69	11	1196	23	8	392	4.25	7	411
1264	9.509	9.567	35.998	36.051	27.79		1351	36	6	402	4.47	18	435
1319	9.129	9.291	35.930	35.981	27.81		1432	34	11	510	4.55	10	423
1357	8.831	9.045	35.395	35.952	27.81		1159	25	7	401	4.58	11	434
1374	8.716	8.881	35.858	35.921	27.82	18	1331	34	4	397	4.59	17	374
1396	8.440	8.605	35.815	35.870	27.82	22	1464	34	6	356	4.64	12	417

STN 12 BARTLETT 1309-80

BARTLETT 1309-30 Stn 12

DATE: 09/13/80 POSITION: 35.62N;7.7W BOTTOM DEPTH: 1400m

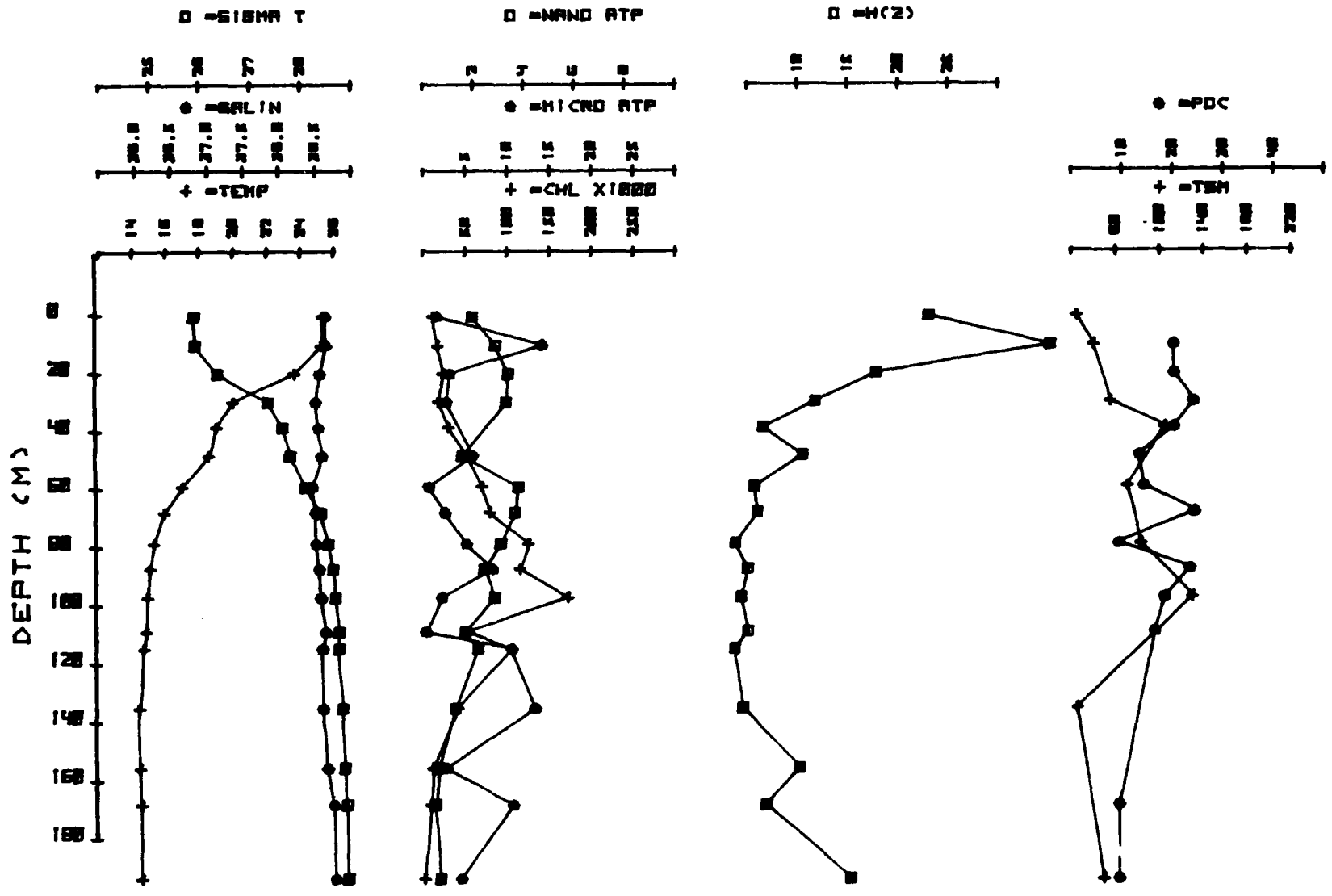
DEPTH (m)	Total Chloro ug/L	Total Phaeo ug/L	<20um Chloro ug/L	<20um Phaeo ug/L	>20um Chloro ug/L	>20um Phaeo ug/L	Total ATP ng/L	Micro ATP ng/L	Nano ATP ng/L	Pico ATP ng/L	NO(3) (ugA/L)	NO(2) (ugA/L)	NH(4) (ugA/L)	PO(4) (ugA/L)	SiO(4) (ugA/L)
4	0.020	0.007	0.017	0.006	0.003	0.001	12.44	1.68	7.39	3.37	0.69	0.25	1.4	0.44	1.90
12	0.031	0.011	0.023	0.009	0.008	0.002	26.00	6.09	5.31	14.10	0.69	0.26	1.5	0.50	1.60
19	0.041	0.012	0.034	0.000	0.007	0.014	43.76	13.79	8.11	21.86	0.75	0.28	1.4	0.44	1.90
22	0.054	0.000	0.032	0.011	0.032	0.000	30.25	9.47	7.45	14.33	0.69	0.28	1.4	0.42	2.20
29	0.058	0.016	0.046	0.012	0.011	0.003	23.48	7.16	6.04	10.28	0.69	0.27	1.5	0.42	1.90
33	0.073	0.017	0.058	0.016	0.019	0.001	25.39	20.13	2.33	2.88	0.69	0.27	1.5	0.33	1.90
38	0.092	0.010	0.050	0.025	0.022	0.000		15.93	1.92		0.63	0.28	1.4	0.30	2.20
47	0.121	0.034	0.096	0.036	0.025	0.000	9.46	2.70	1.36	4.33	0.63	0.24	1.3	0.39	2.50
61	0.164	0.073	0.106	0.067	0.057	0.006	11.57	6.13	2.06	3.38	0.56	0.20	1.3	0.36	2.50
77	0.166	0.149	0.115	0.122	0.051	0.028	12.89	7.65	2.13	3.11	0.69	0.22	1.2	0.36	2.50
96	0.095	0.032	0.104	0.102	0.000	0.000	6.51	1.82	1.88	2.31	1.63	0.19	1.2	0.39	2.90
121	0.026	0.055	0.036	0.047	0.000	0.007	6.46	0.94	1.47	4.05	3.38	0.17	1.1	0.39	2.90
146											3.94	0.18	1.1	0.39	3.30
191											6.63	0.19	1.2	0.42	4.10
290							4.40			3.21	10.88	0.15	1.1	0.51	5.10
485							3.71			2.85	14.52	0.15	1.1	0.83	6.70
683							4.48			3.57	18.15	0.15	1.0	1.00	10.20
874											18.63	0.15	1.0	1.11	12.10
1068											18.02	0.15	1.0	1.11	12.40
1264											17.66	0.15	1.0	1.11	13.00
1310							2.05			0.73	17.90	0.15	0.9	1.14	13.30
1357											18.02	0.15	0.9	1.14	13.70
1374							2.61	0.00	0.39	2.25	18.15	0.15	0.9	1.17	14.00
1396							2.86			0.70	18.27	0.16	0.9	1.17	14.30

STN 12 BARTLETT 1309-80

DEPTH PROFILES OF DATA

USNS BARTLETT 1309-80

STATIONS 2 THROUGH 12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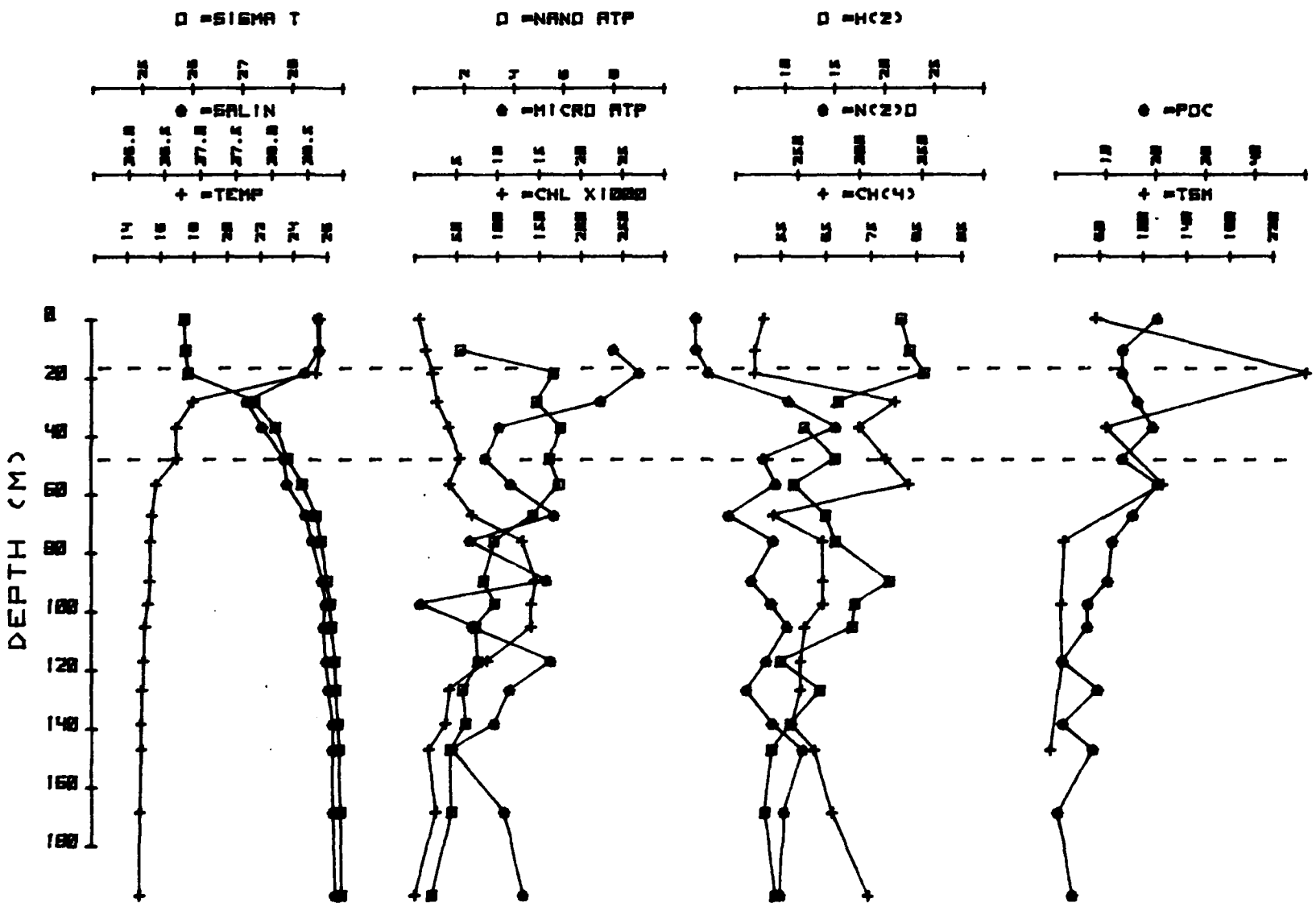
+ =CHL X1000
+ =TSM
DEPTH (M)

STN 2 1309-80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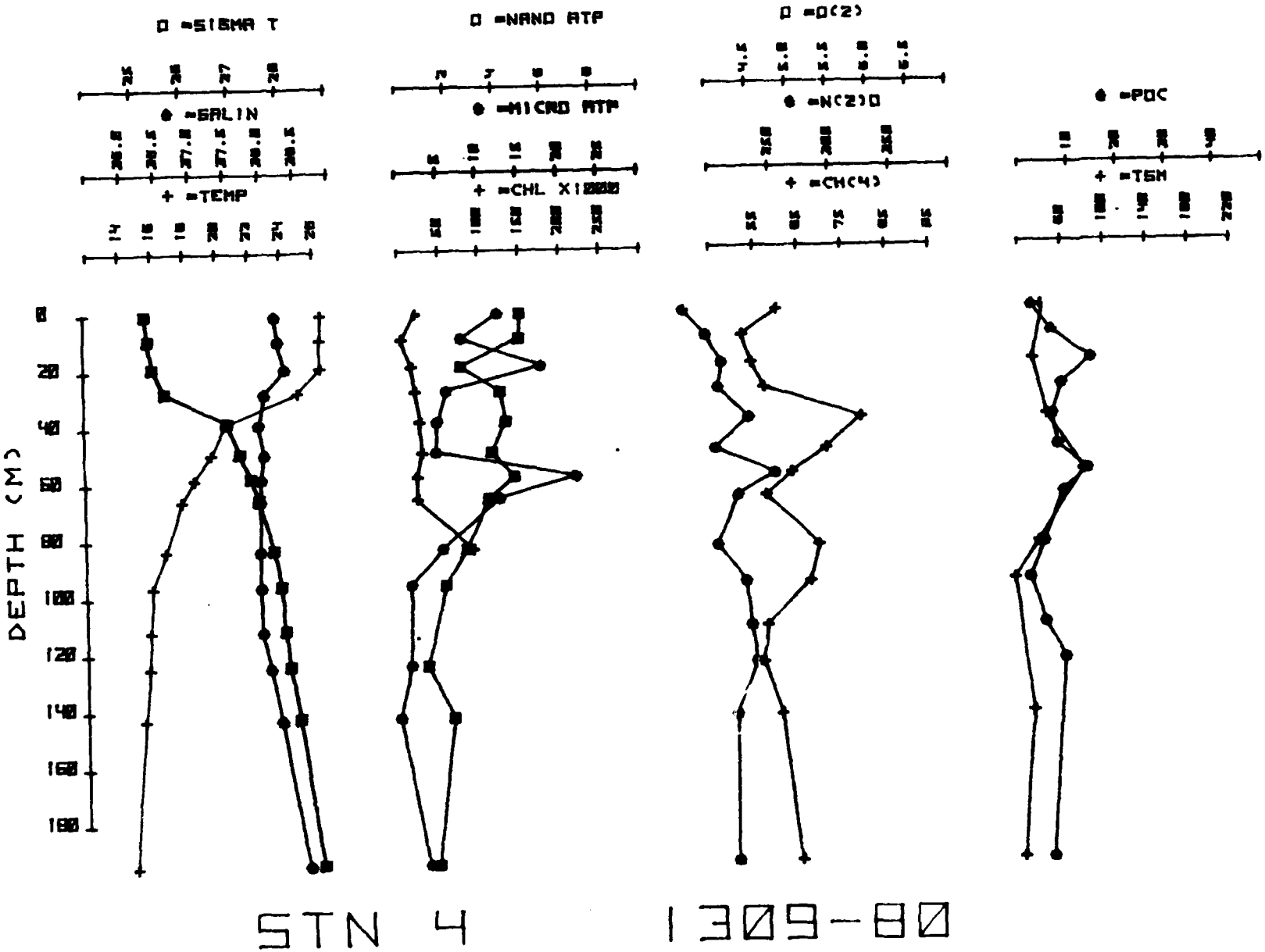
+ =TEMP
+ =CHL X
+ =CH(4)
+ =TSM
DEPTH (M)
0
20
40
60
80
100
120
140
160
180

STN 3 1309-80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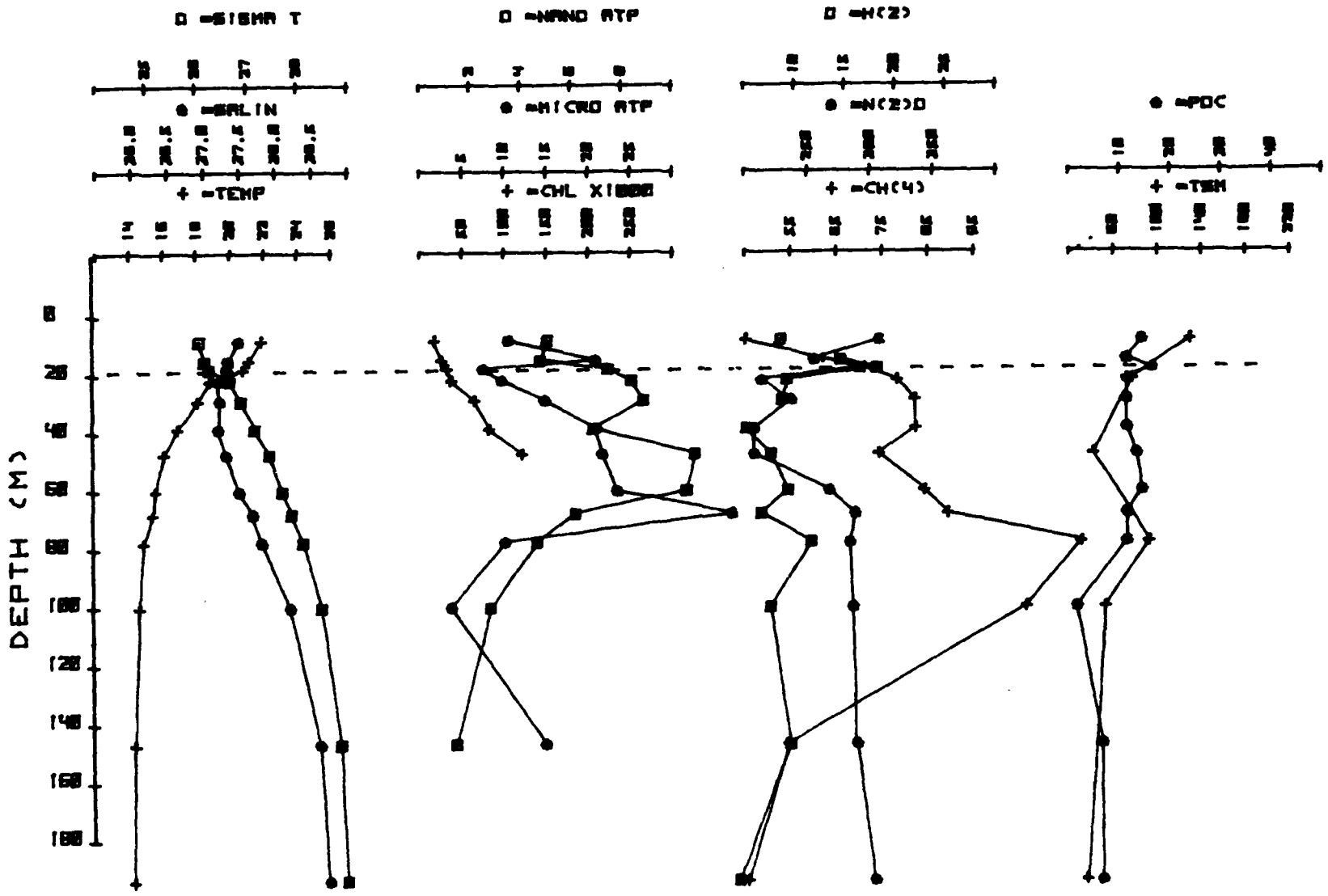
25
26
27
28
● =SALIN
26.0
26.5
27.0
27.5
28.0
28.5
+ =TEMP
14
16
18
20
22
24
26
□ =NANO ATP
2
4
6
8
● =MICRO ATP
5
10
15
20
25
+ =CHL X
□ =O(2)
4.5
5.0
5.5
6.0
6.5
● =N(2)O
+ =CH(4)
55
65
75
85
95
● =POC
+ =TSM
DEPTH (M)
0
20
40
60
80
100
120
140
160
180
STN 4
1309-80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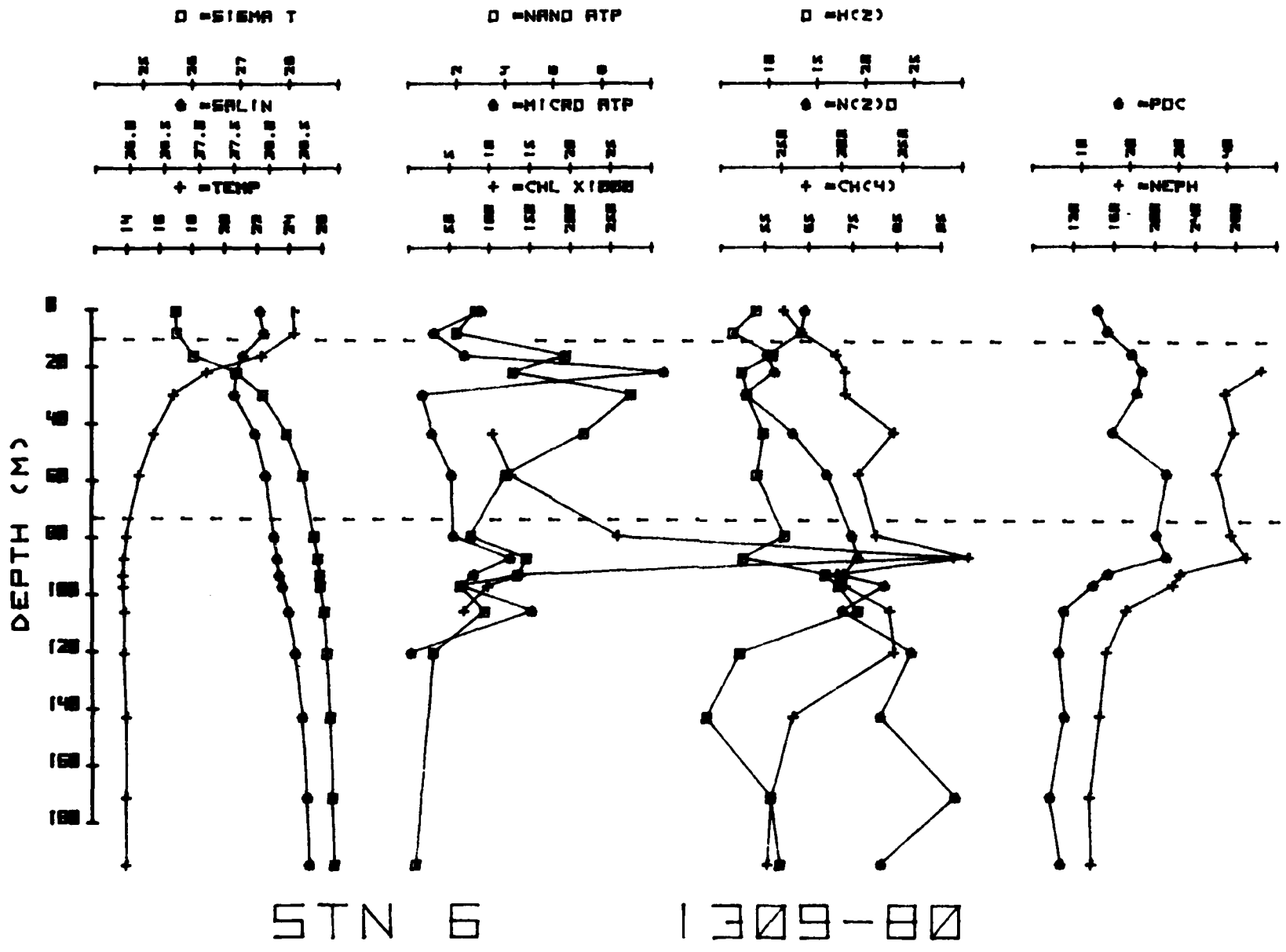
● =SALIN
+ =TEMP
□ =NANO ATP
● =MICRO ATP
+ =CHL X1000
□ =N(2)
● =N(2)D
+ =CH(4)
● =POC
+ =TSM
DEPTH (M)
0
20
40
60
80
100
120
140
160
180

STN 5 1309-80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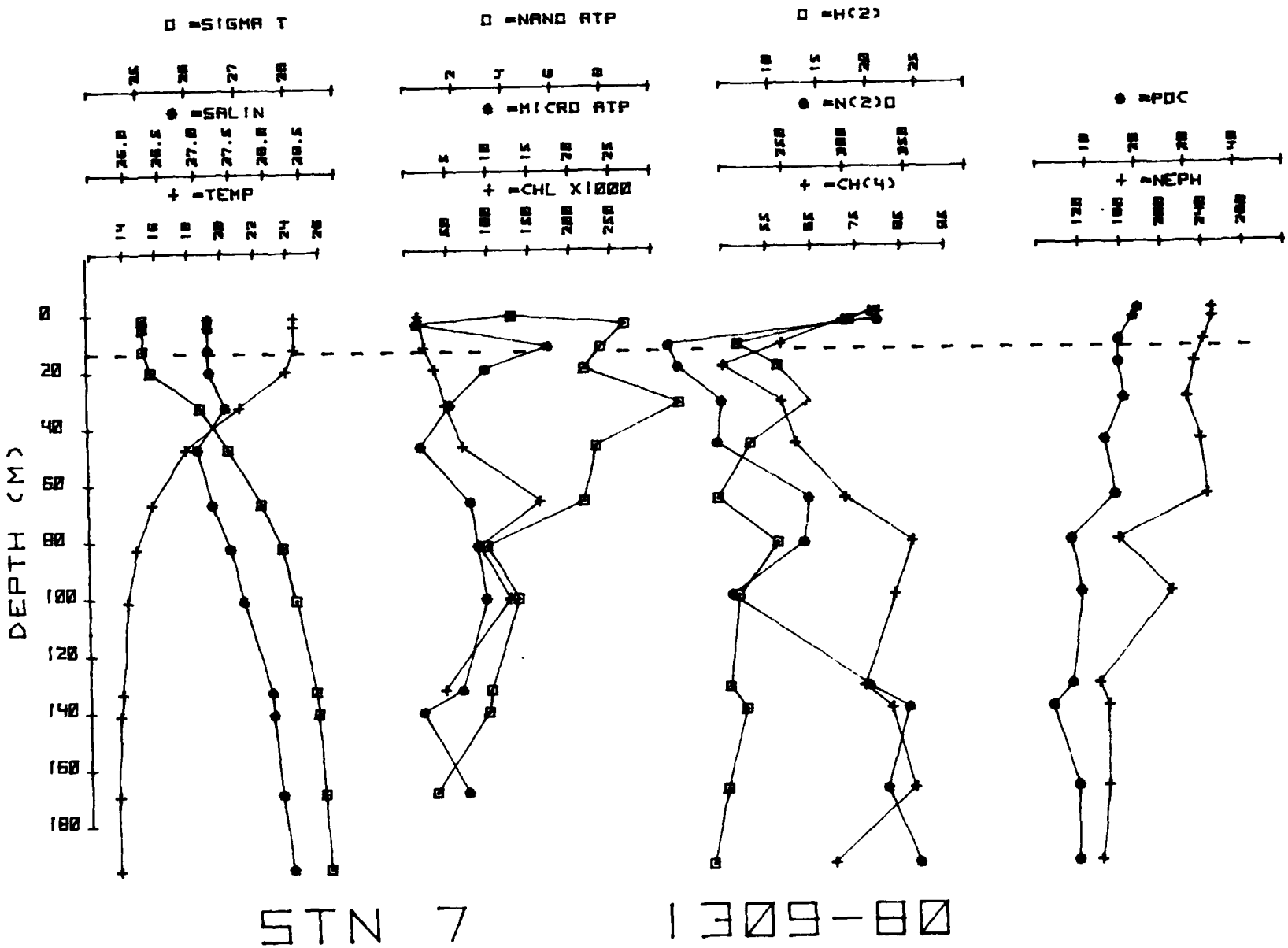
□ =NANO ATP
□ =H(2)
● =SALIN
● =MICRO ATP
● =N(2)O
● =POC
+ =TEMP
+ =CHL X1000
+ =CH(4)
+ =NEPH
DEPTH (M)

STN 6 1309-80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26
27
28
● =SALIN
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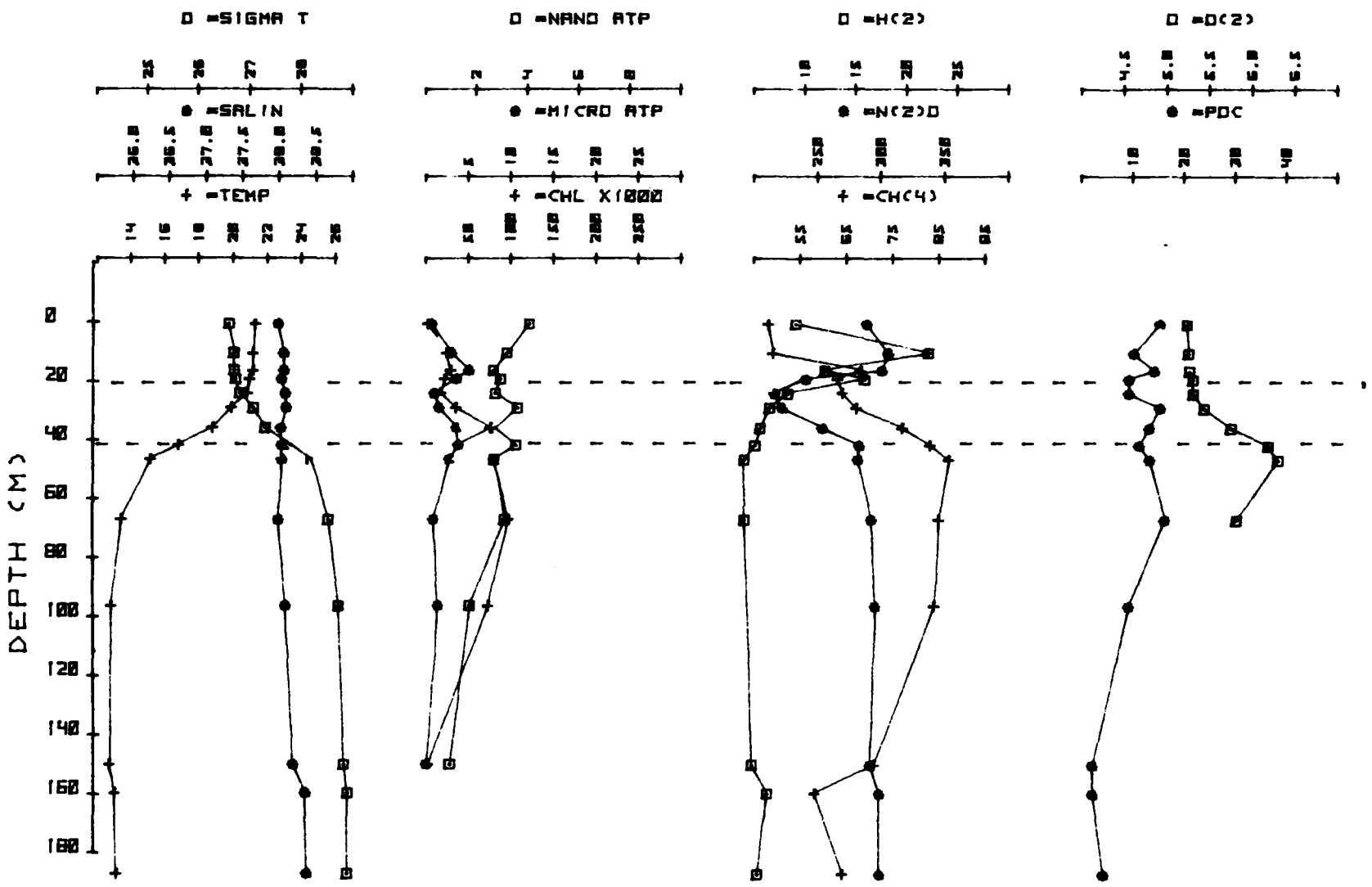
26.5
27.0
27.5
28.0
28.5
+ =TEMP
14
16
18
20
22
24
26
□ =NANO ATP
2
4
6
8
● =MICRO ATP
5
10
15
20
25
+ =CHL X1000
50
100
150
200
250
□ =H(2)
10
15
20
25
● =N(2)O
250
300
350
+ =CH(4)
65
75
85
● =POC
10
20
30
40
+ =NEPH
1000
2000
3000
4000
DEPTH (M)
0
20
40
60
80
100
120
140
160
180
STN 7
1309-80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+ =TEMP
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□ =NANO ATP
2 4 6 8
● =MICRO ATP
5 10 15 20 25
+ =CHL X1000
50 100 150 200 250
□ =H(2)
10 15 20 25
● =N(2)O
250 300 350
+ =CH(4)
55 65 75 85 95
□ =O(2)
4.5 5.0 5.5 6.0 6.5
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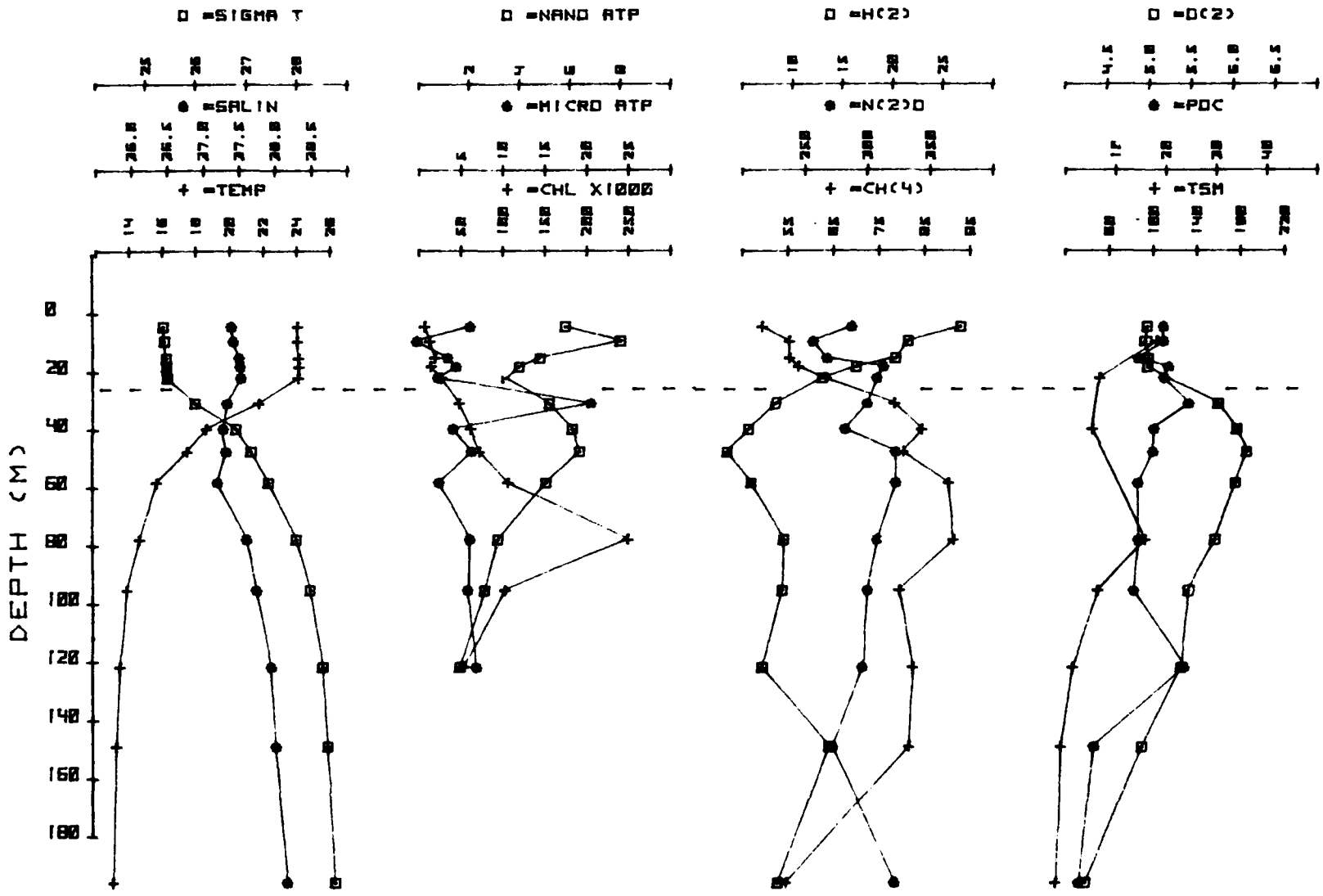
10 20 30 40
DEPTH (M)
0 20 40 60 80 100 120 140 160 180
STN 8
1309-80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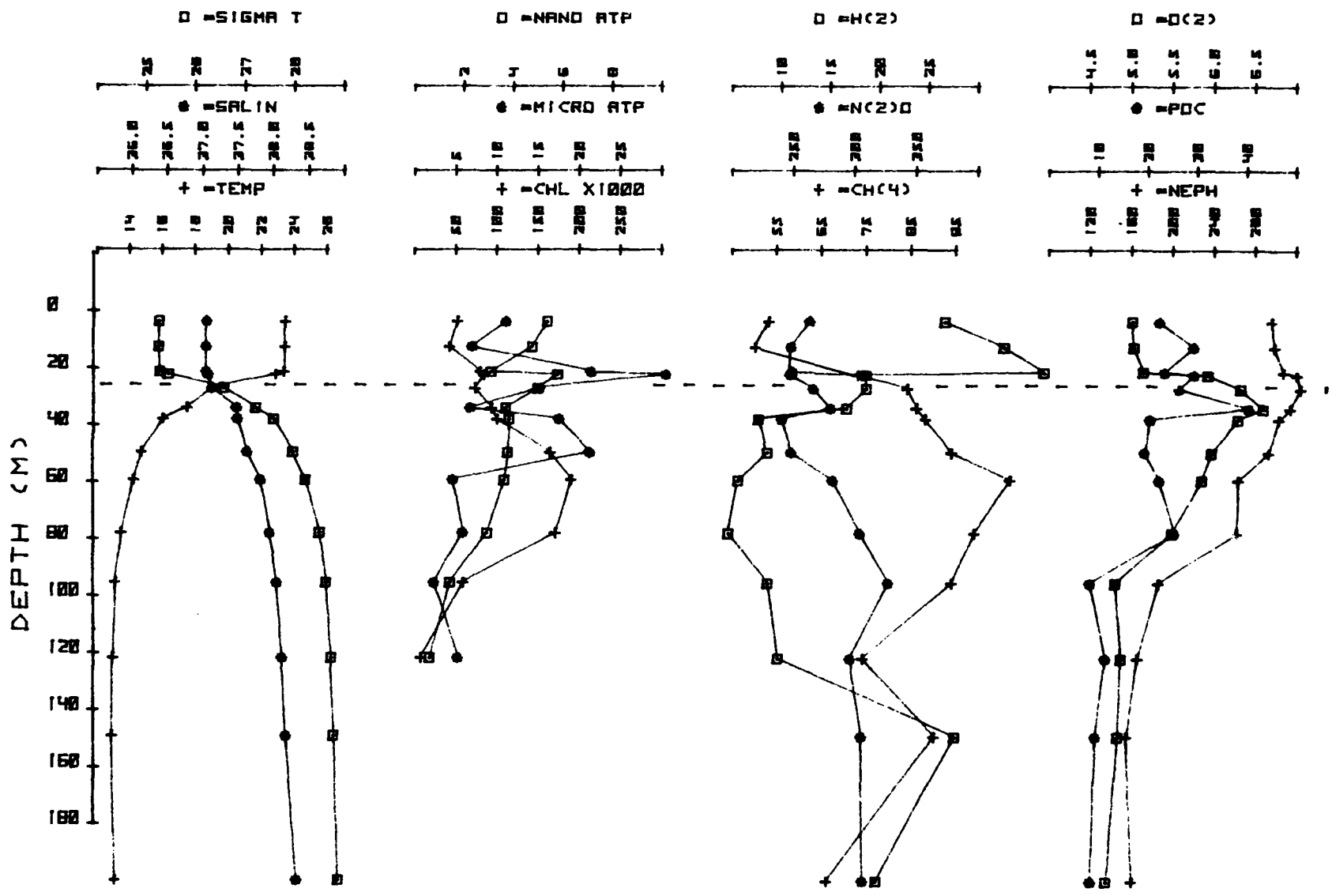
● =SALIN
26.0 26.5 27.0 27.5 28.0 28.5
+ =TEMP
14 16 18 20 22 24 26
□ =NANO ATP
2 4 6 8
● =MICRO ATP
4 10 15 20 25
+ =CHL X1000
50 100 150 200 250
□ =N(2)
10 15 20 25
● =N(2)O
250 300 350
+ =CH(4)
55 65 75 85 95
□ =O(2)
4.5 5.0 5.5 6.0 6.5
● =POC
10 20 30 40
+ =TSM
50 100 140 180 220
DEPTH (M)
0 20 40 60 80 100 120 140 160 180
STN 9 1309-80



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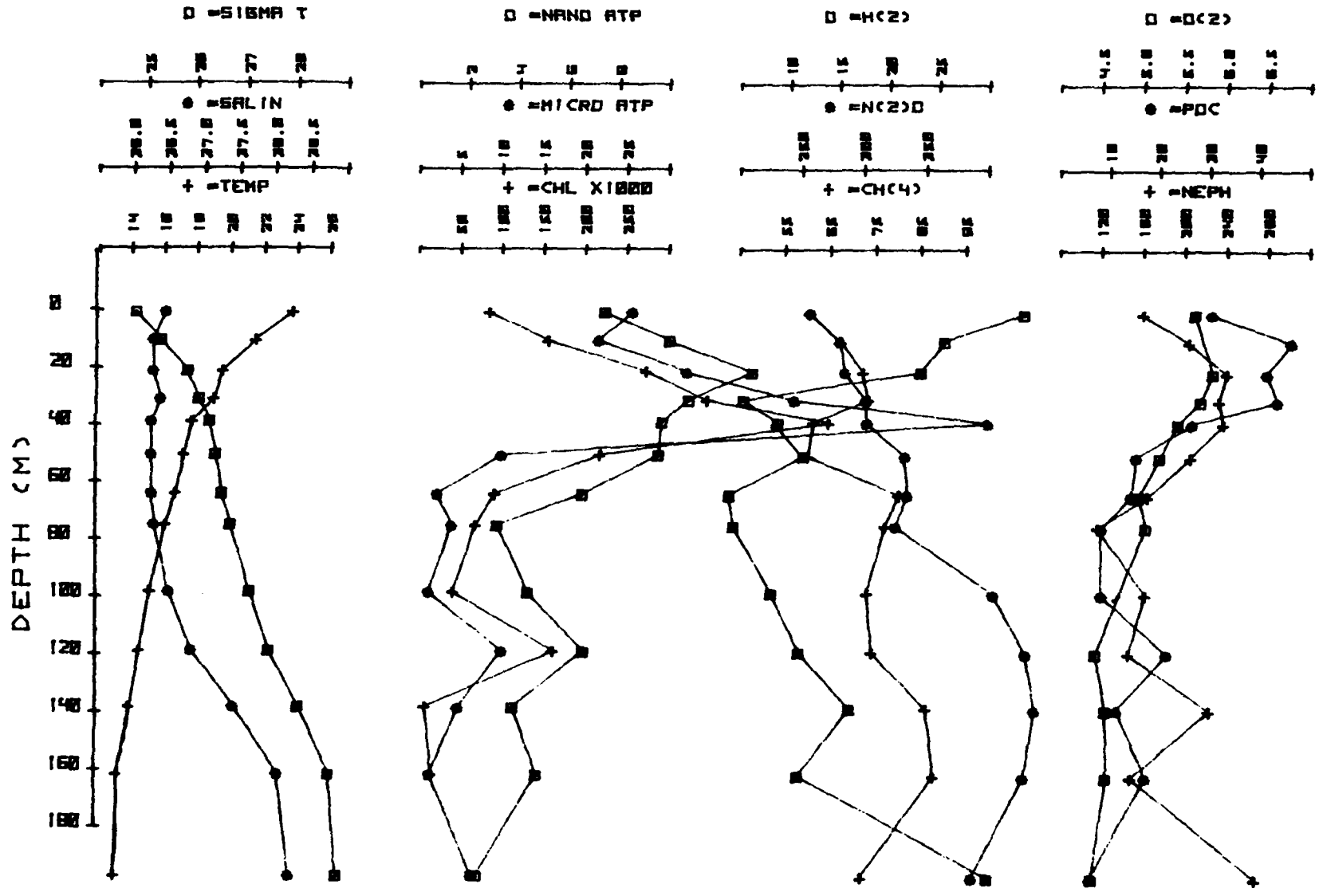

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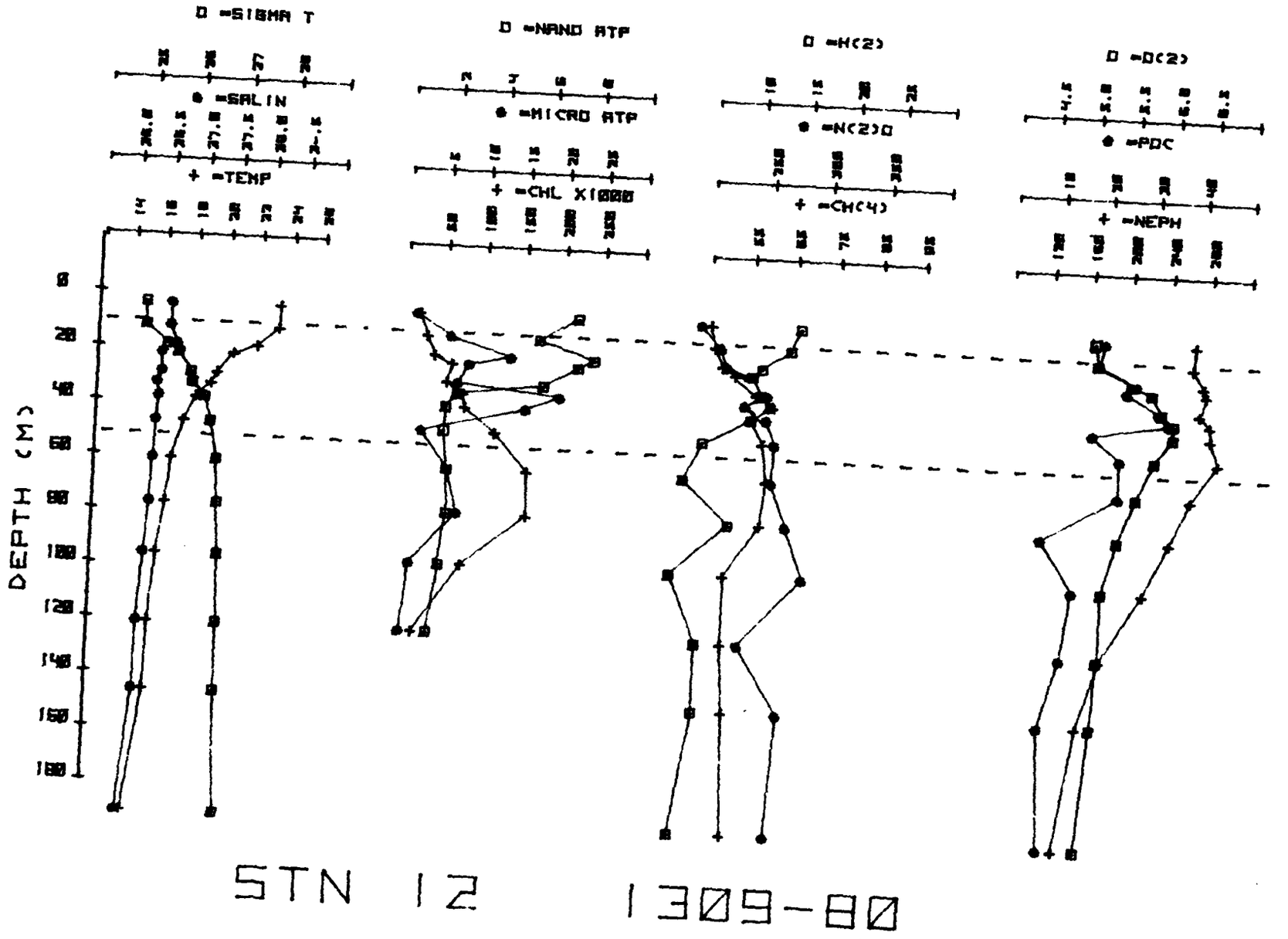
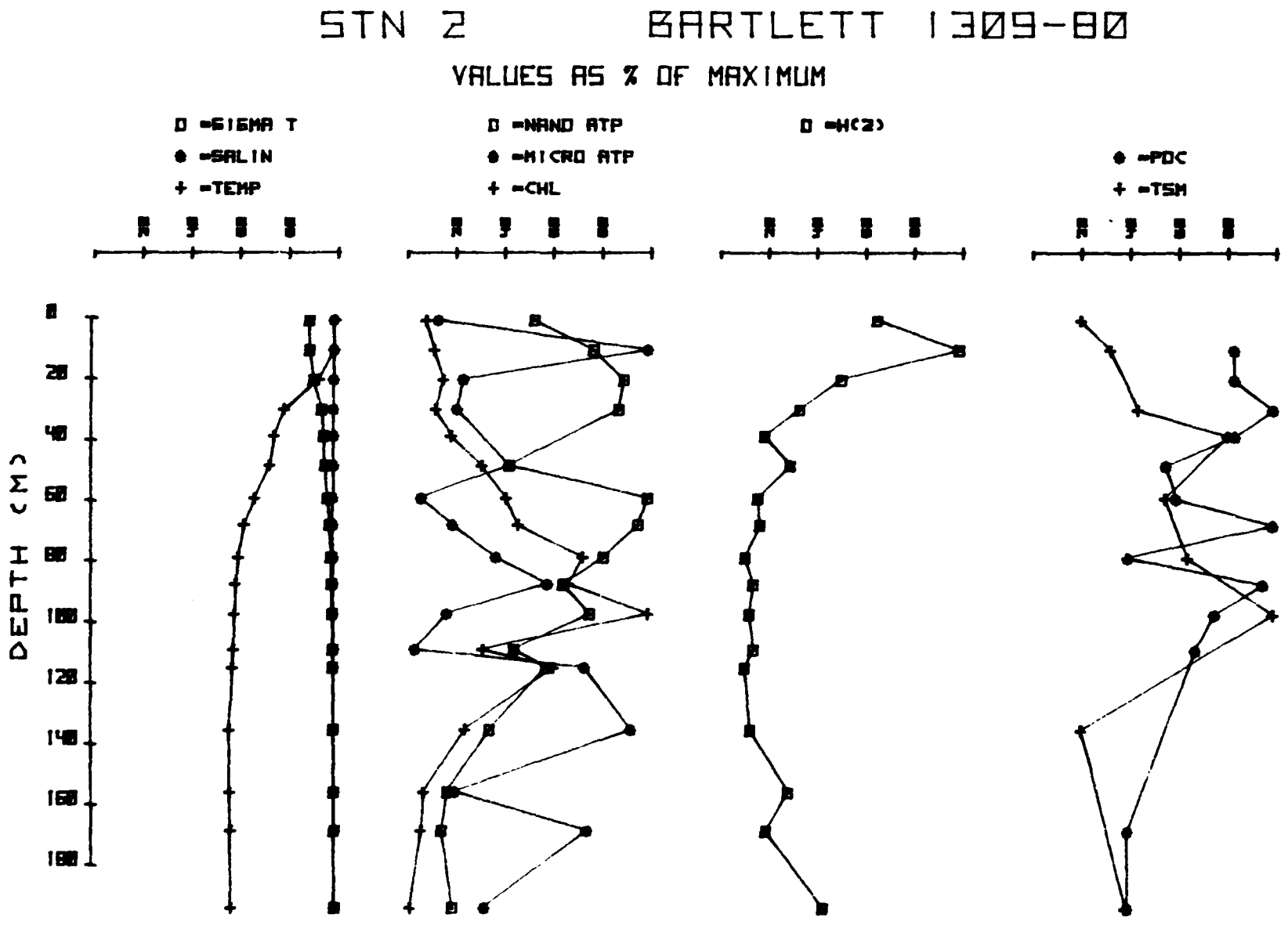


STN 12 1309-80

DEPTH PROFILES OF NORMALIZED DATA

USNS BARTLETT 1309-80

STATIONS 2 THROUGH 12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* =POC
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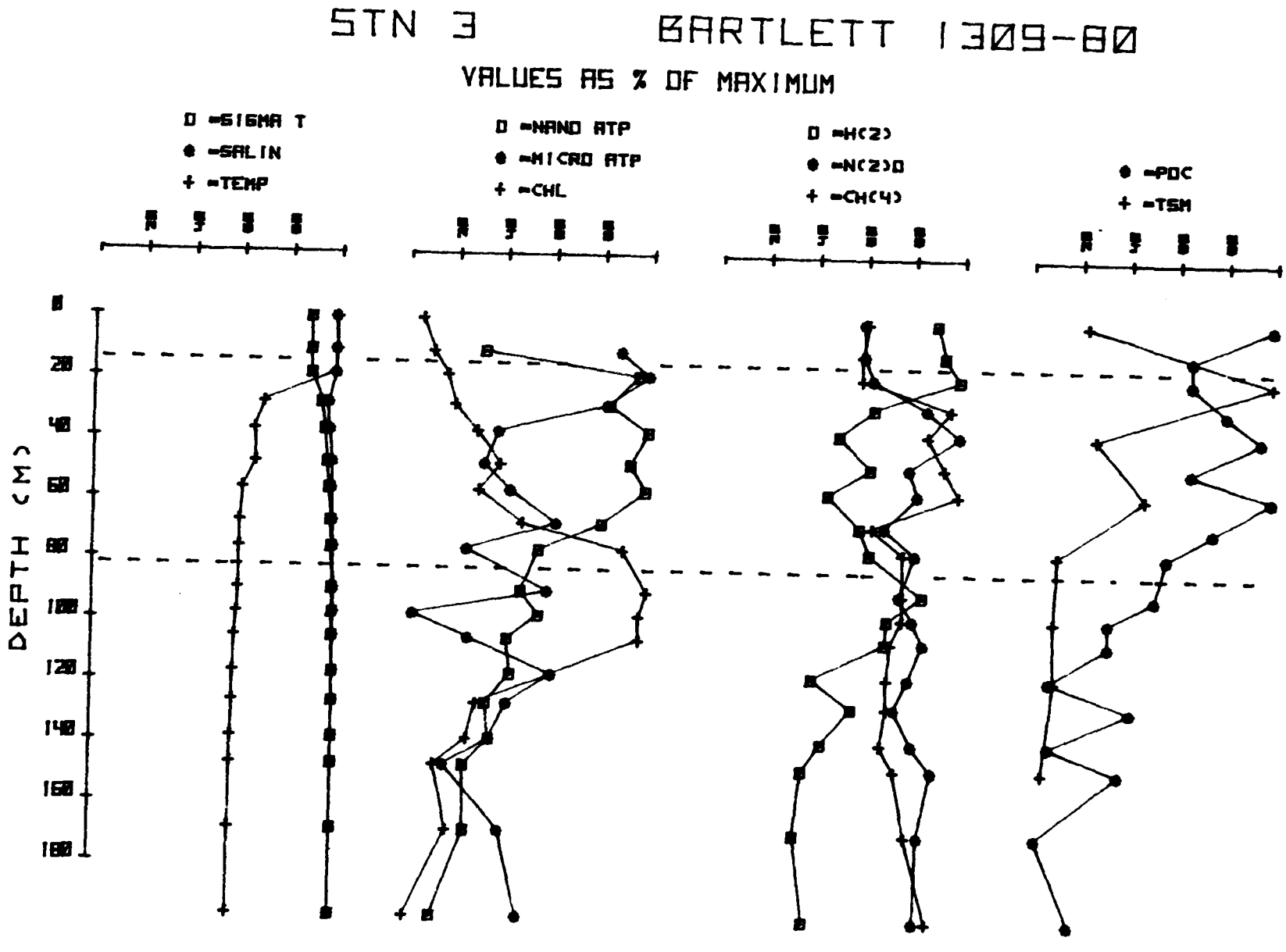
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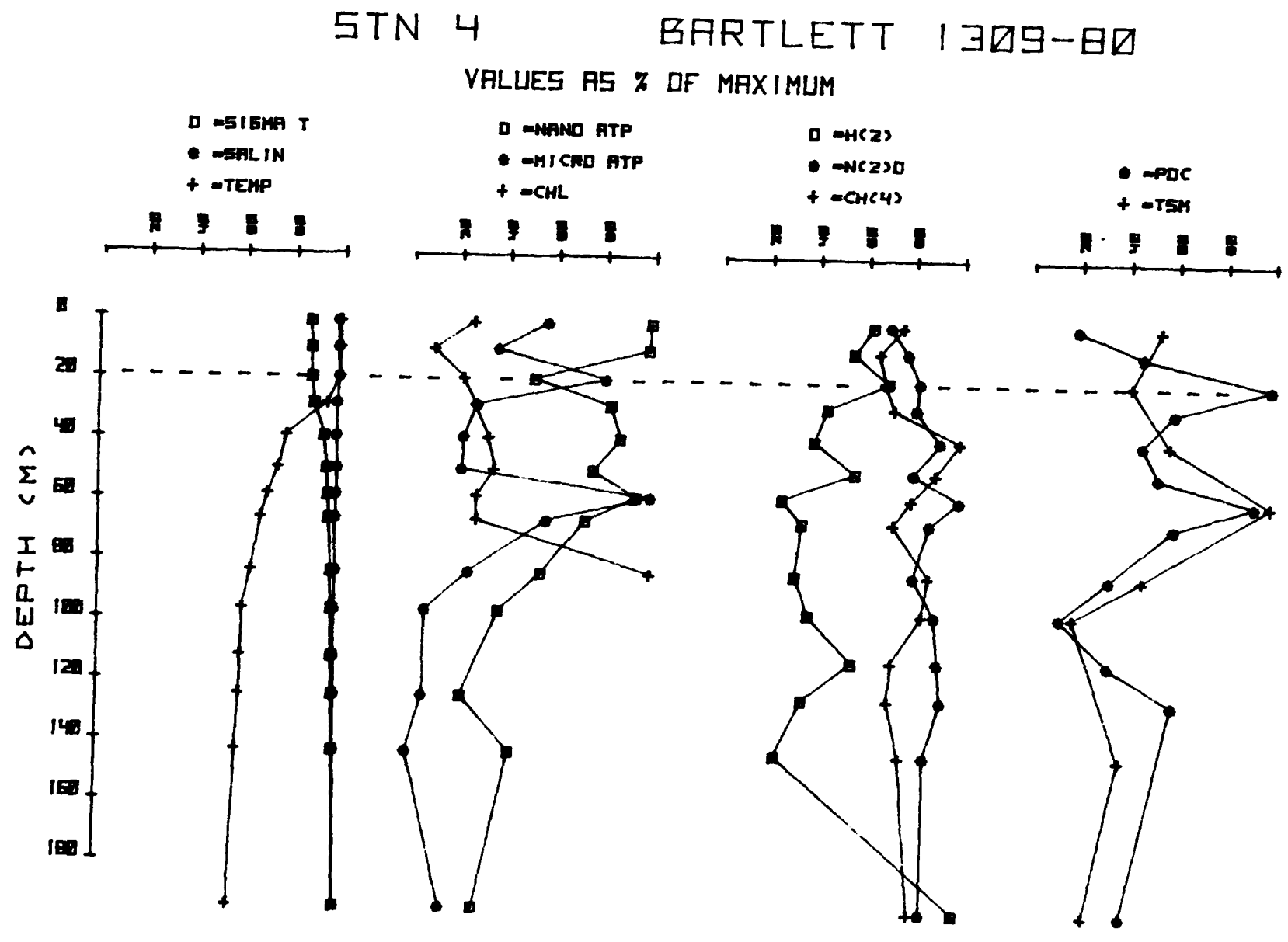
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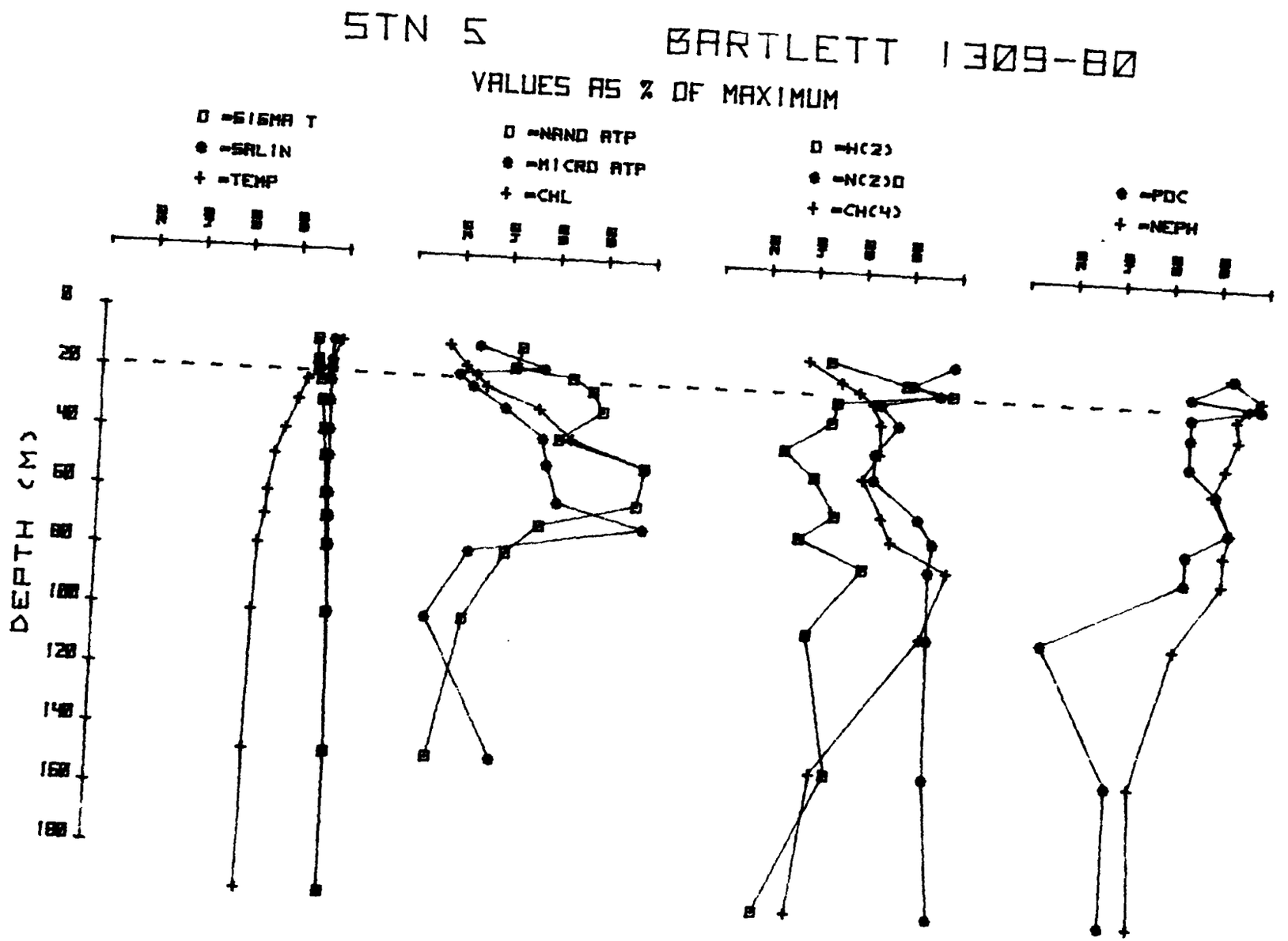
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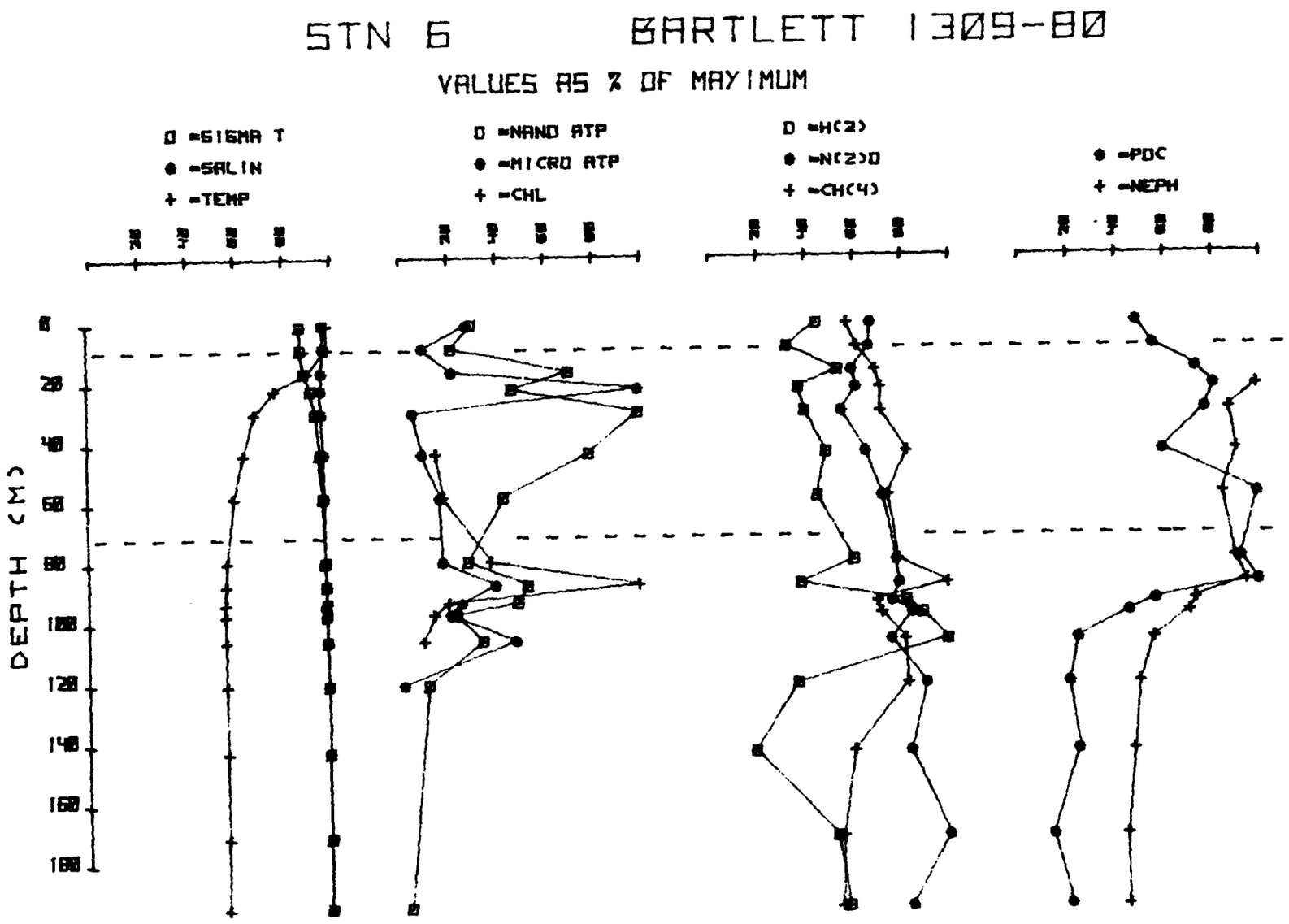
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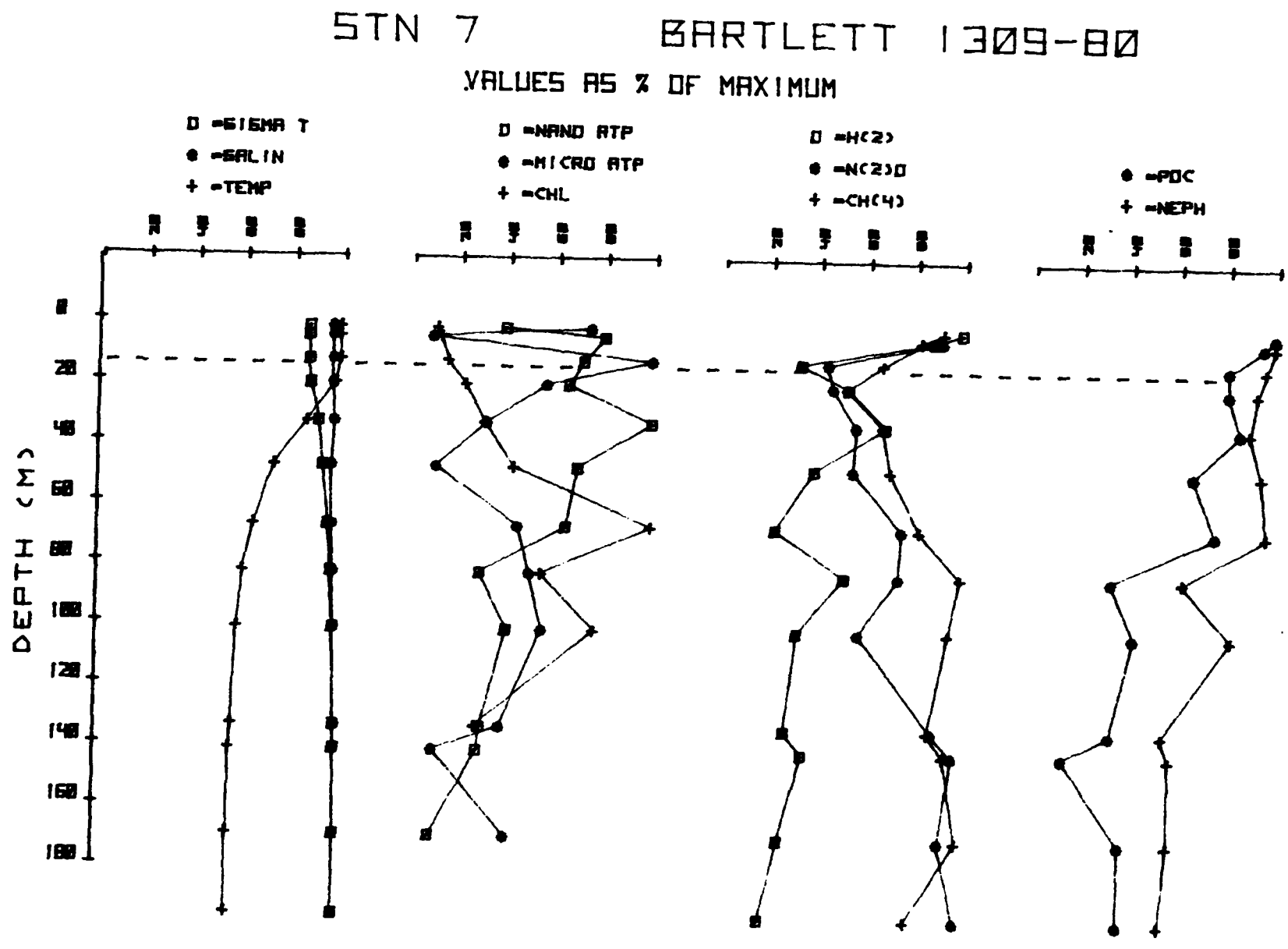
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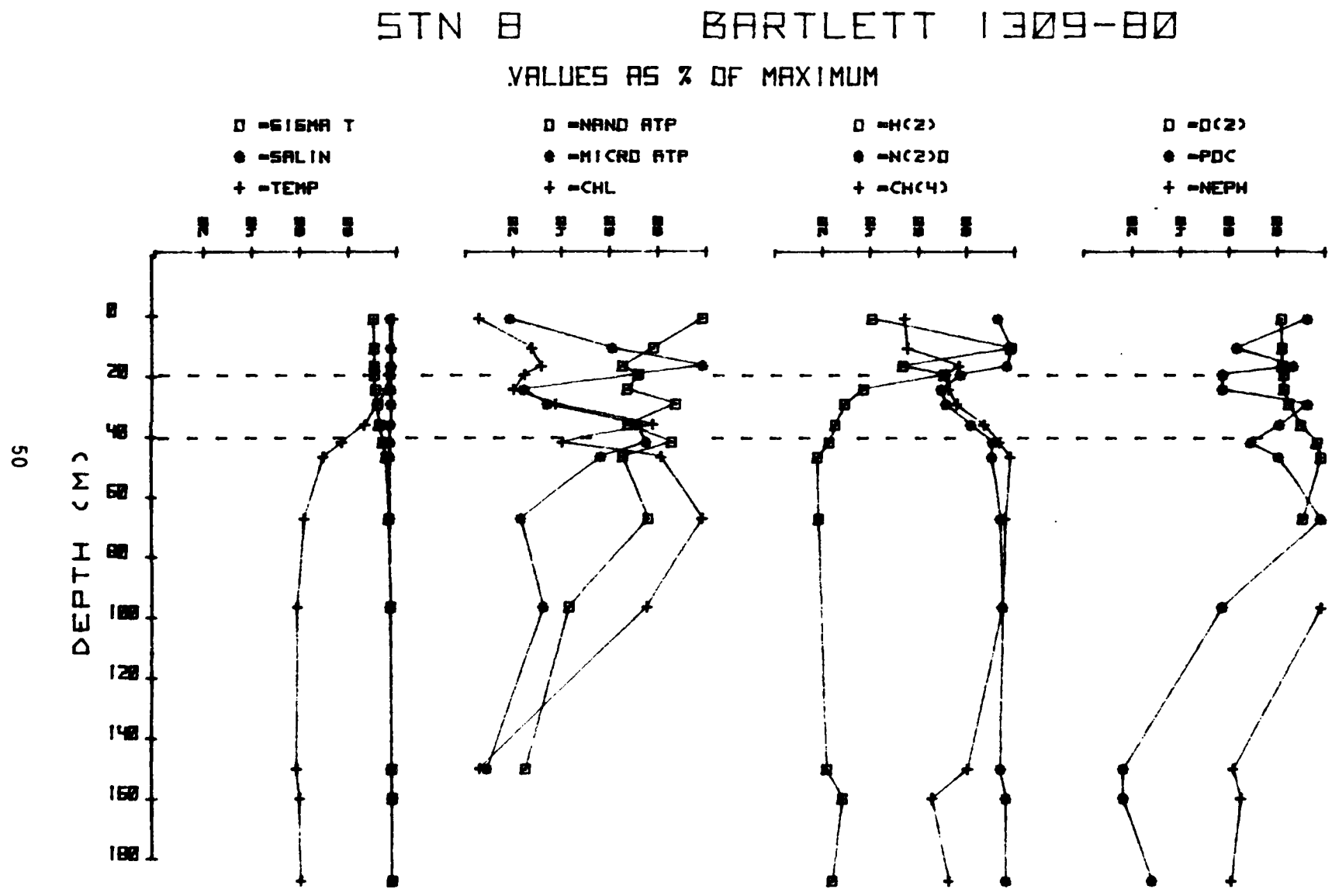
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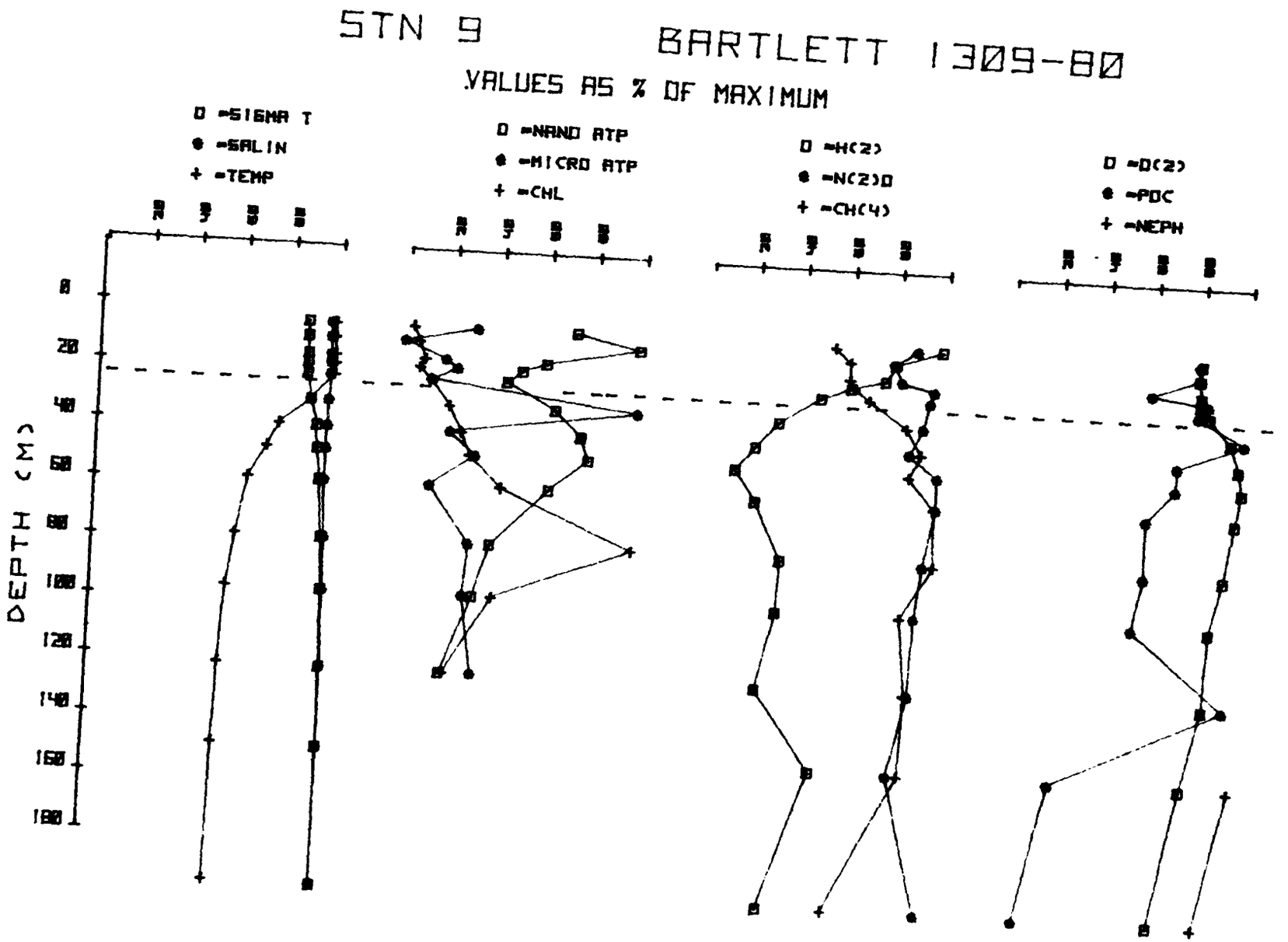
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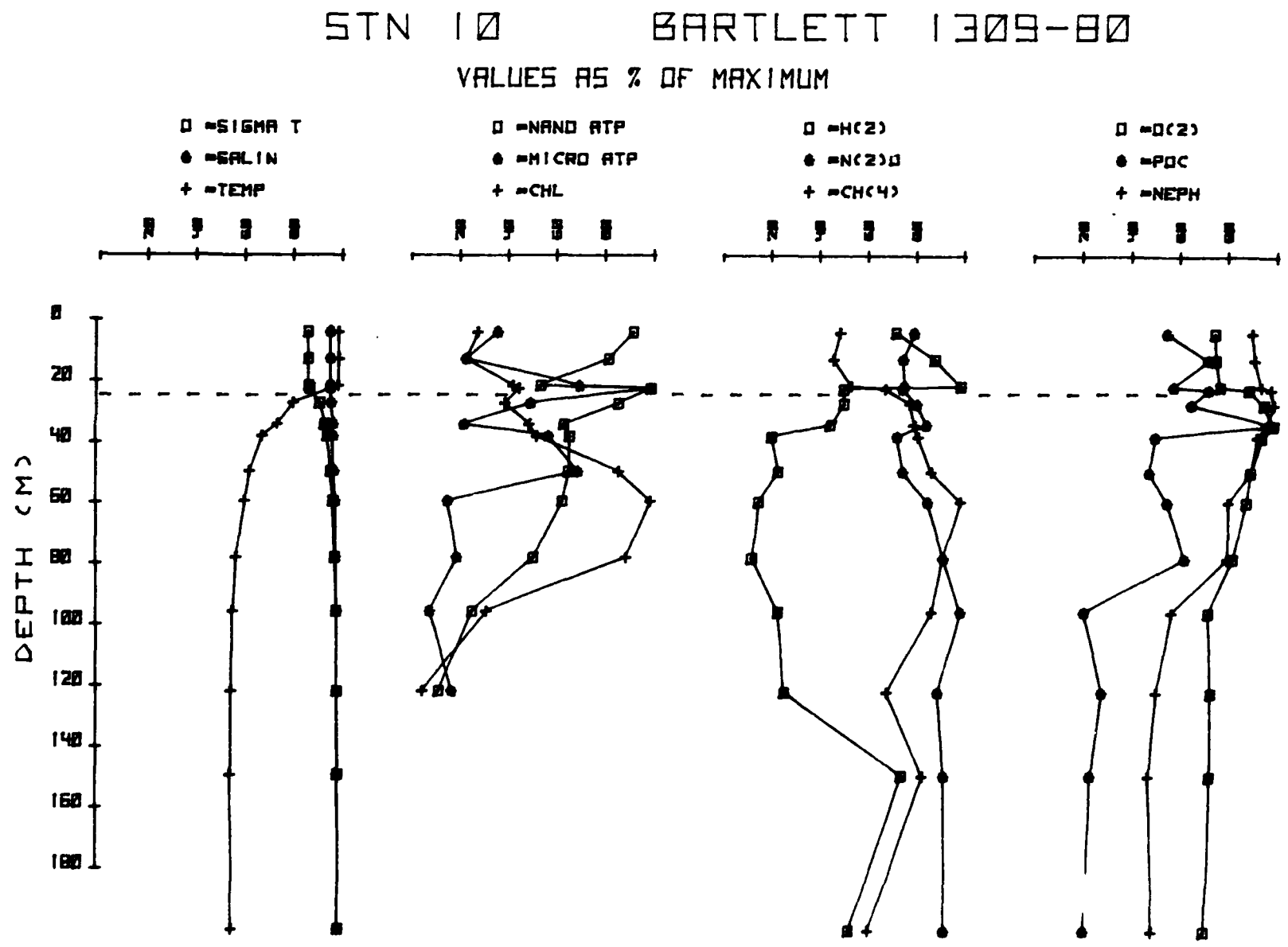
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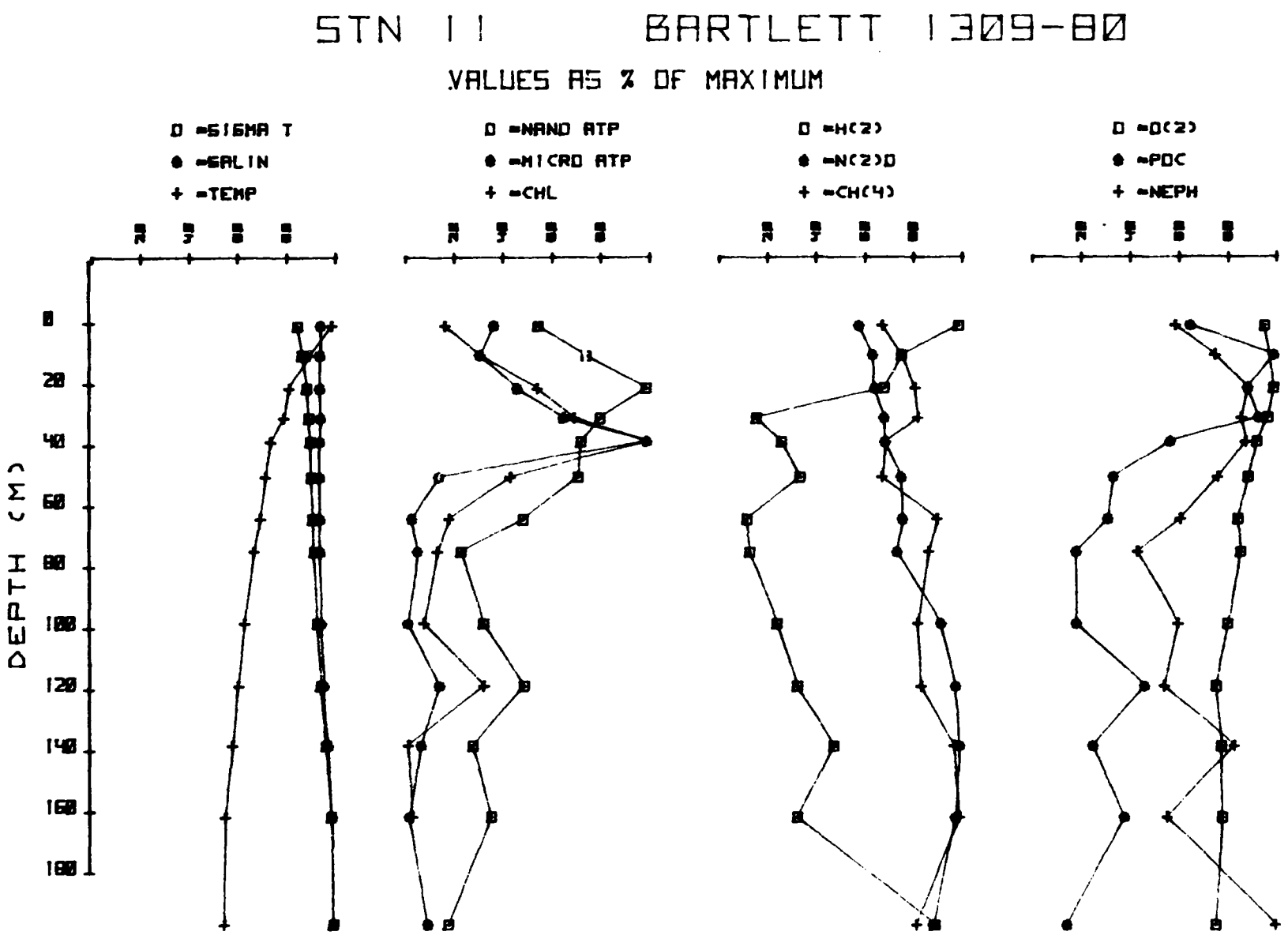
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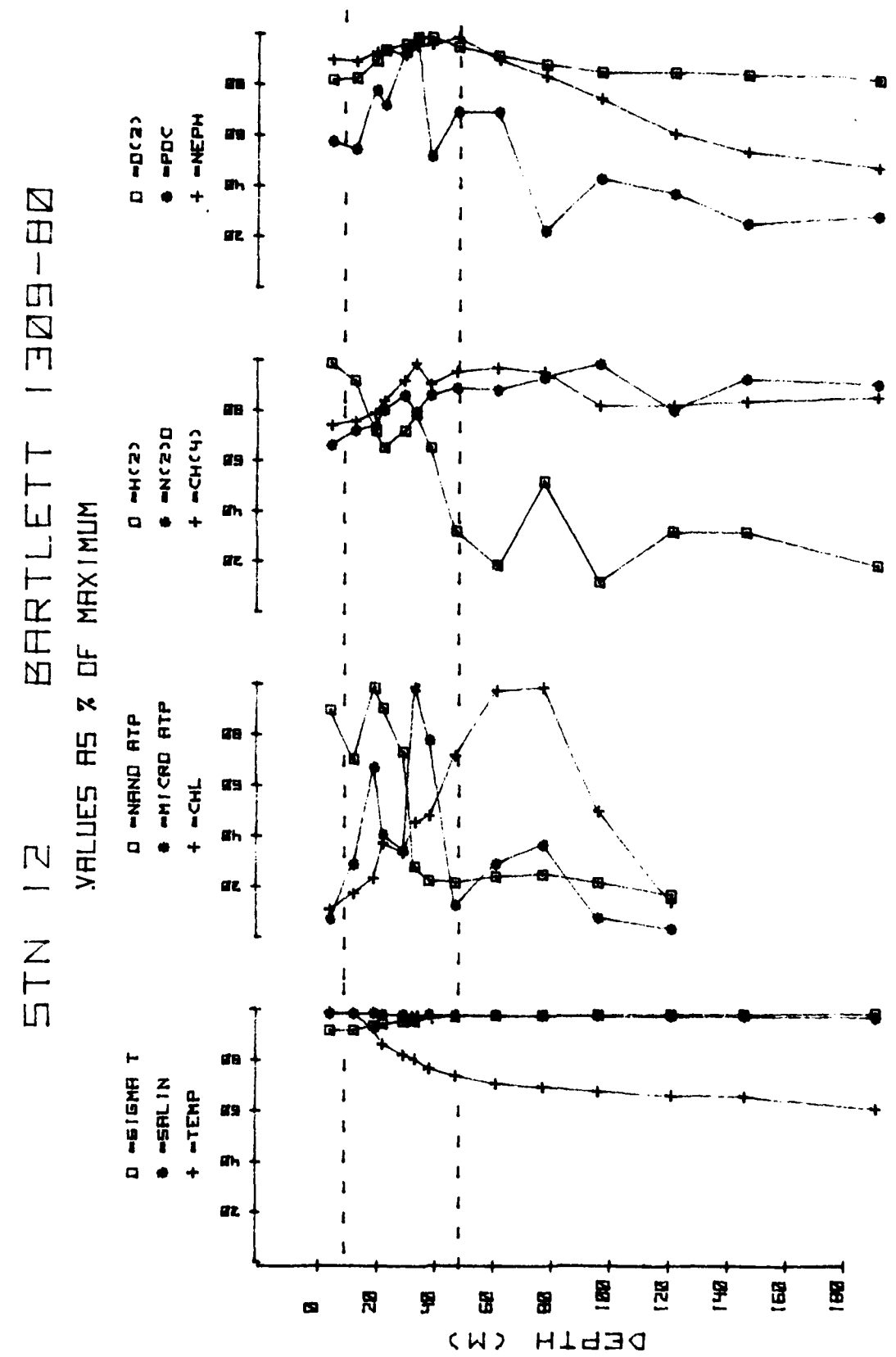
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● =N(2)O
+ =CH(4)
□ =O(2)
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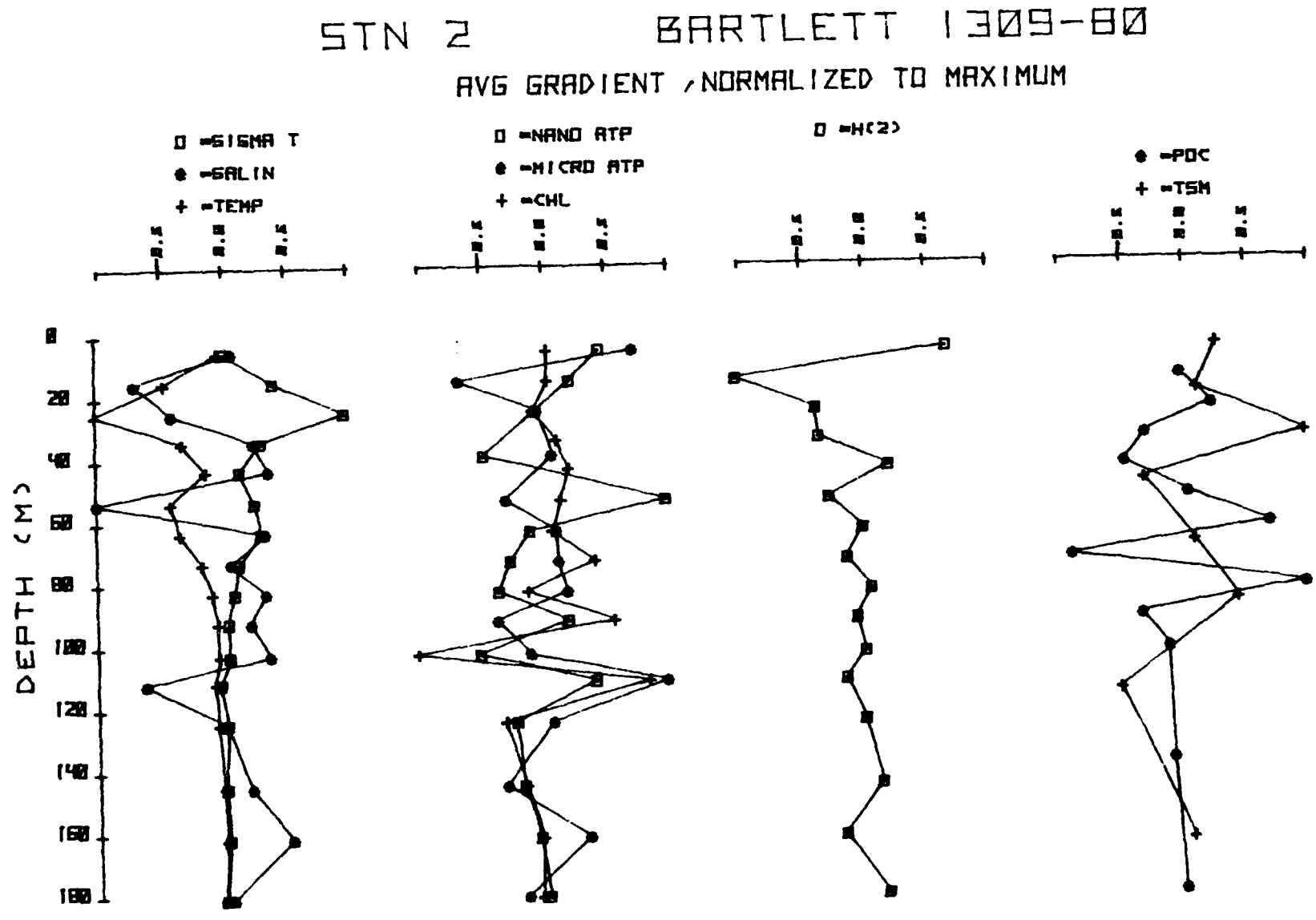
+ =NEPH
DEPTH (M)

DEPTH PROFILES OF NORMALIZED GRADIENTS

USNS BARTLETT 1309-80

STATIONS 2 THROUGH 12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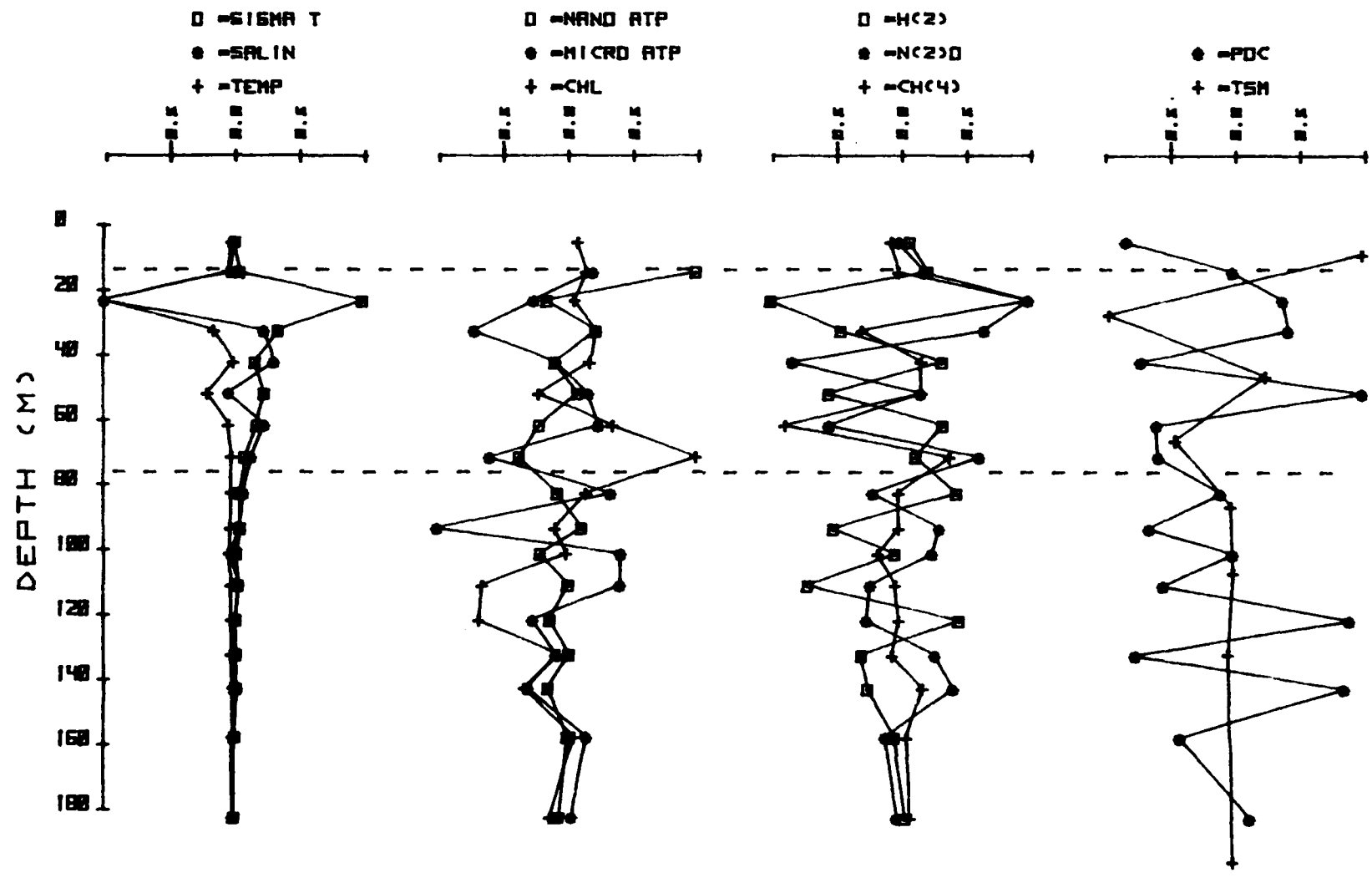
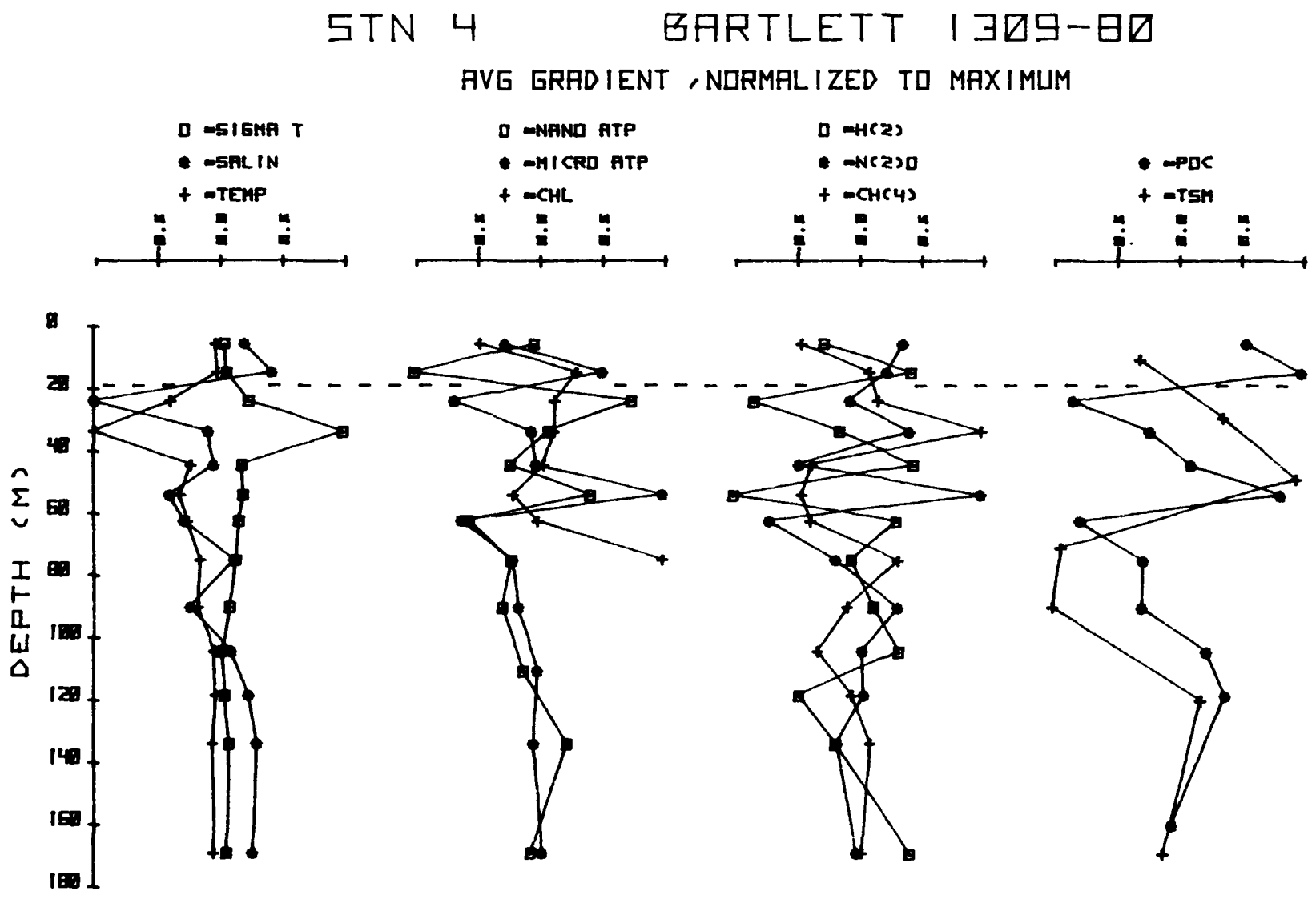
AVG GRADIENT /NORMALIZED TO MAXIMUM

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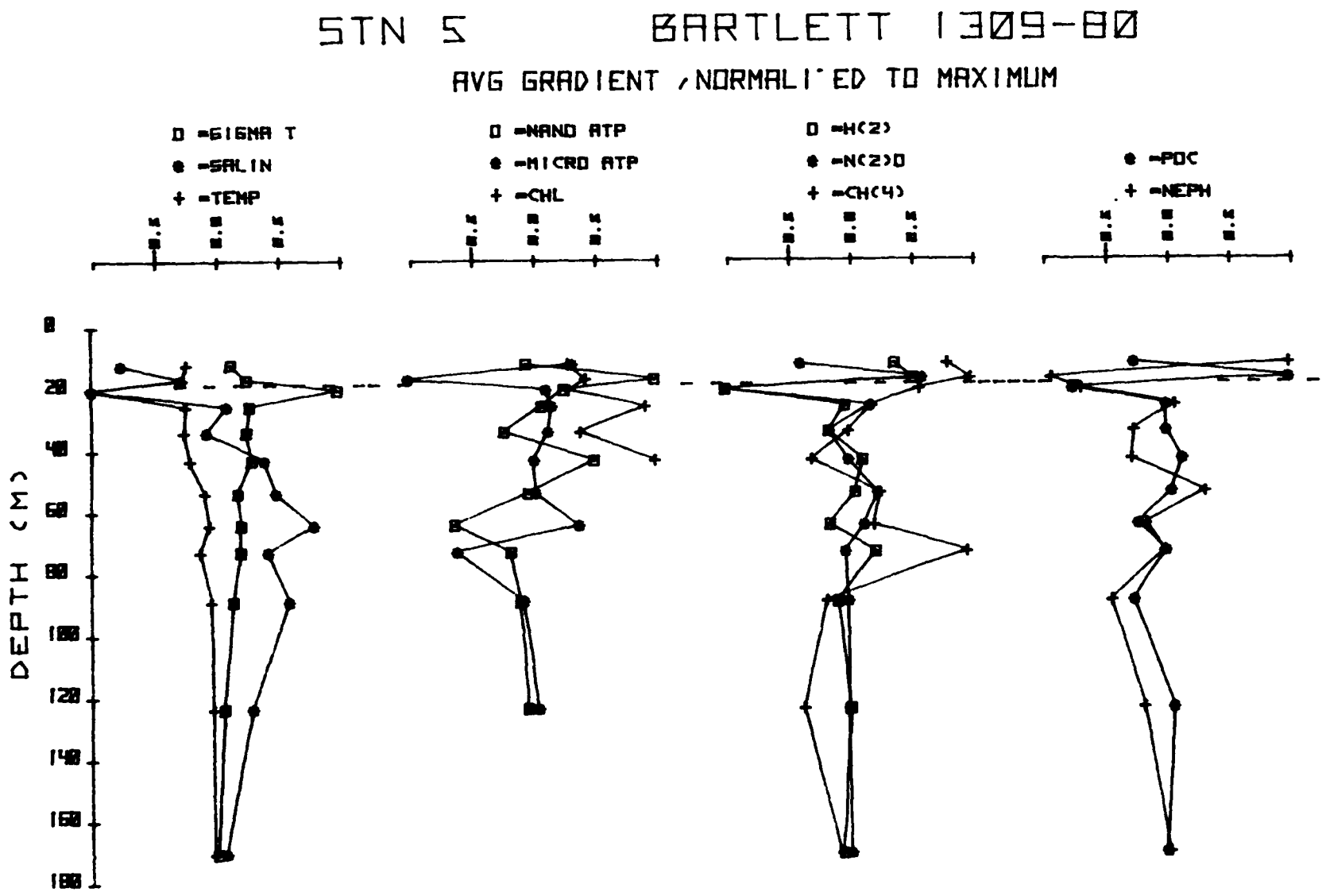
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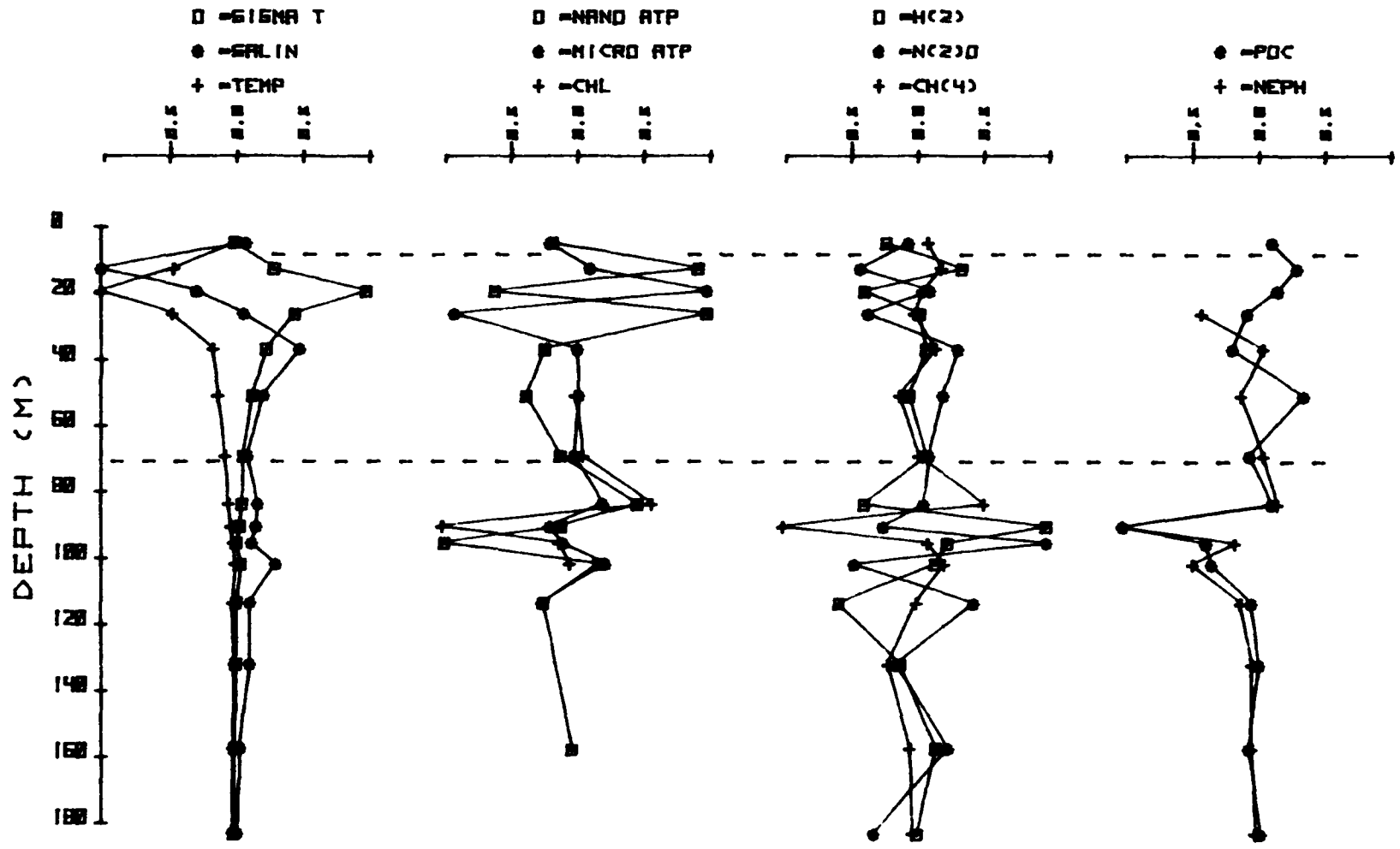
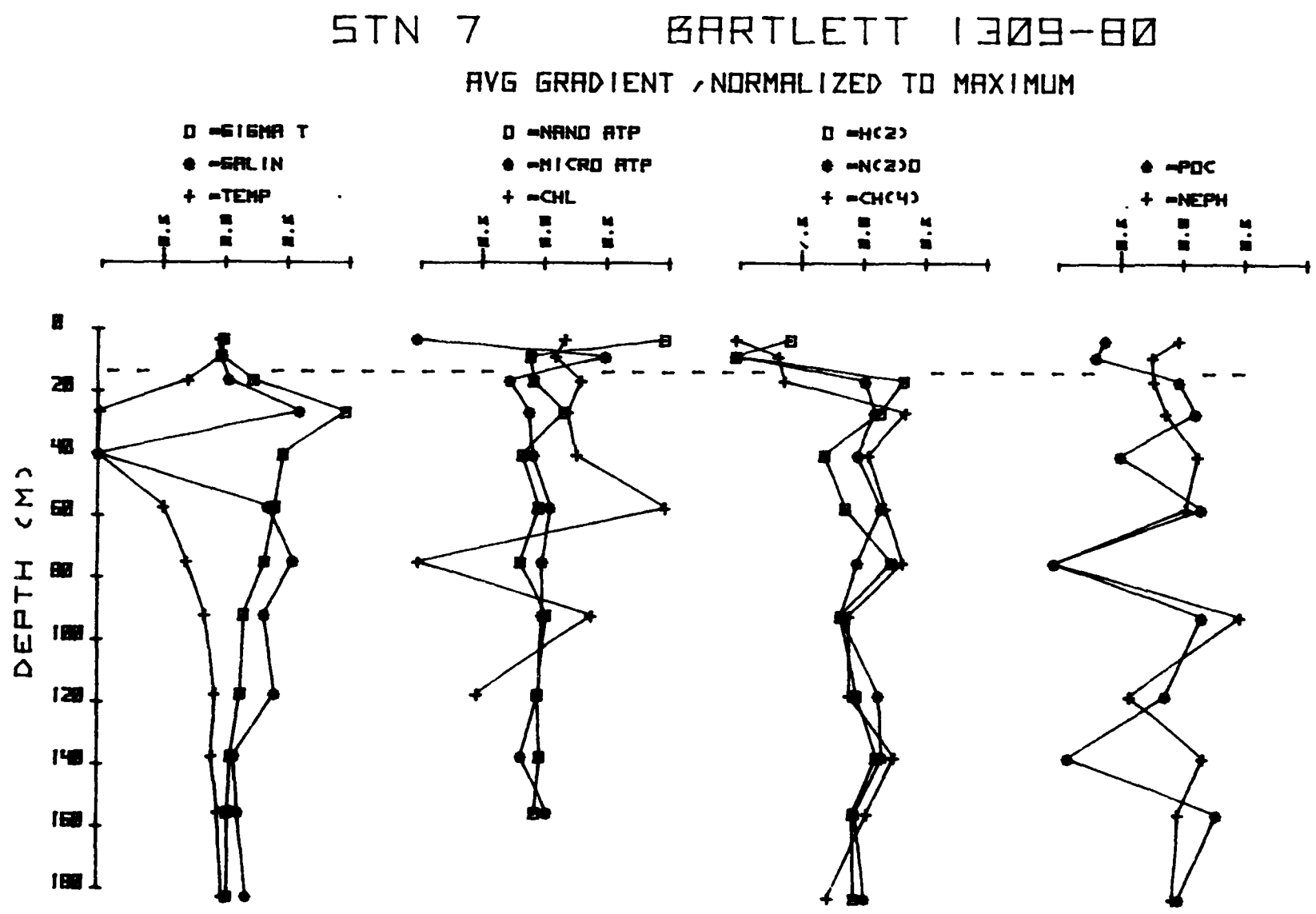
STN 6 BARTLETT 1309-80

AVG GRADIENT /NORMALIZED TO MAXIMUM

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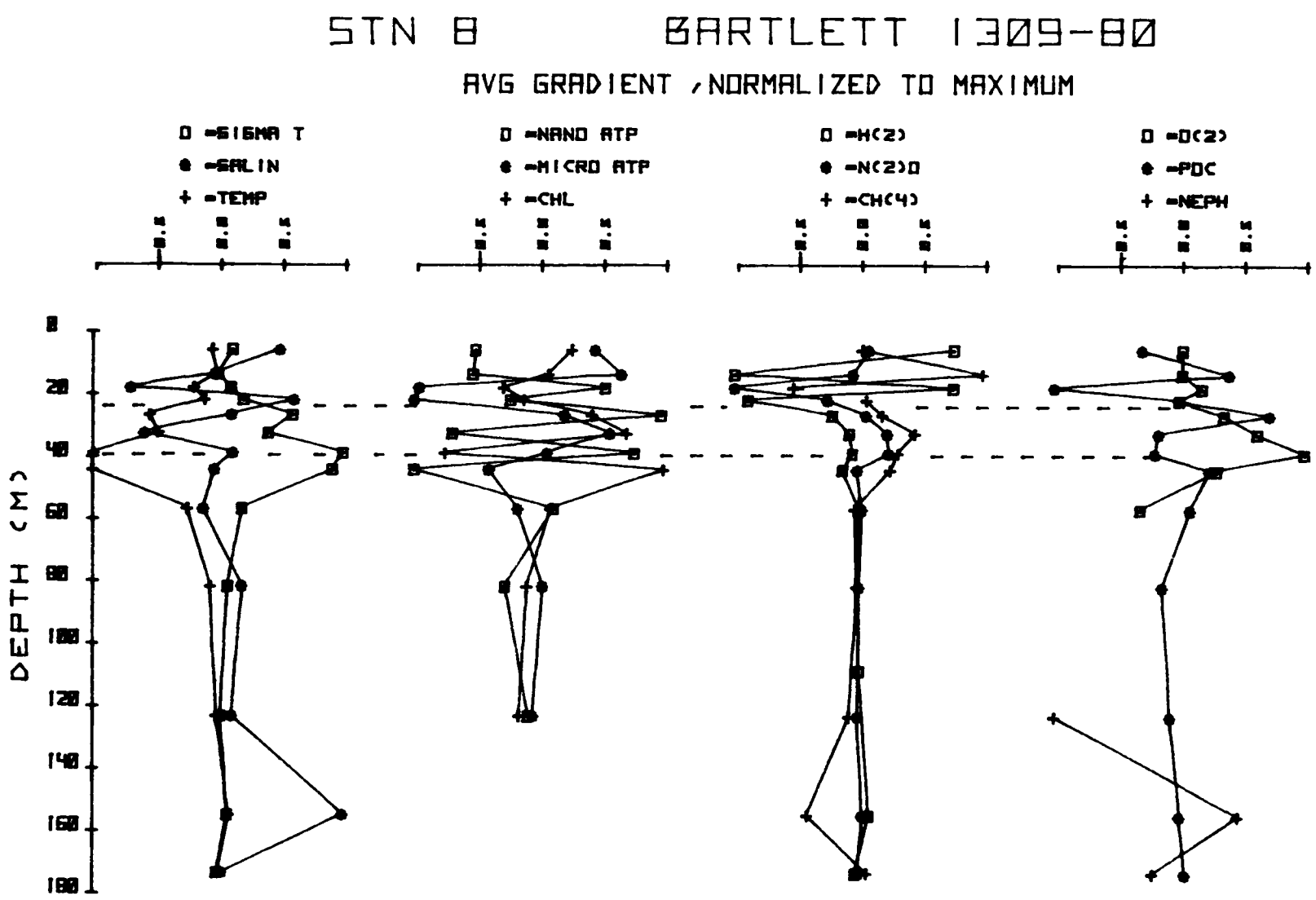
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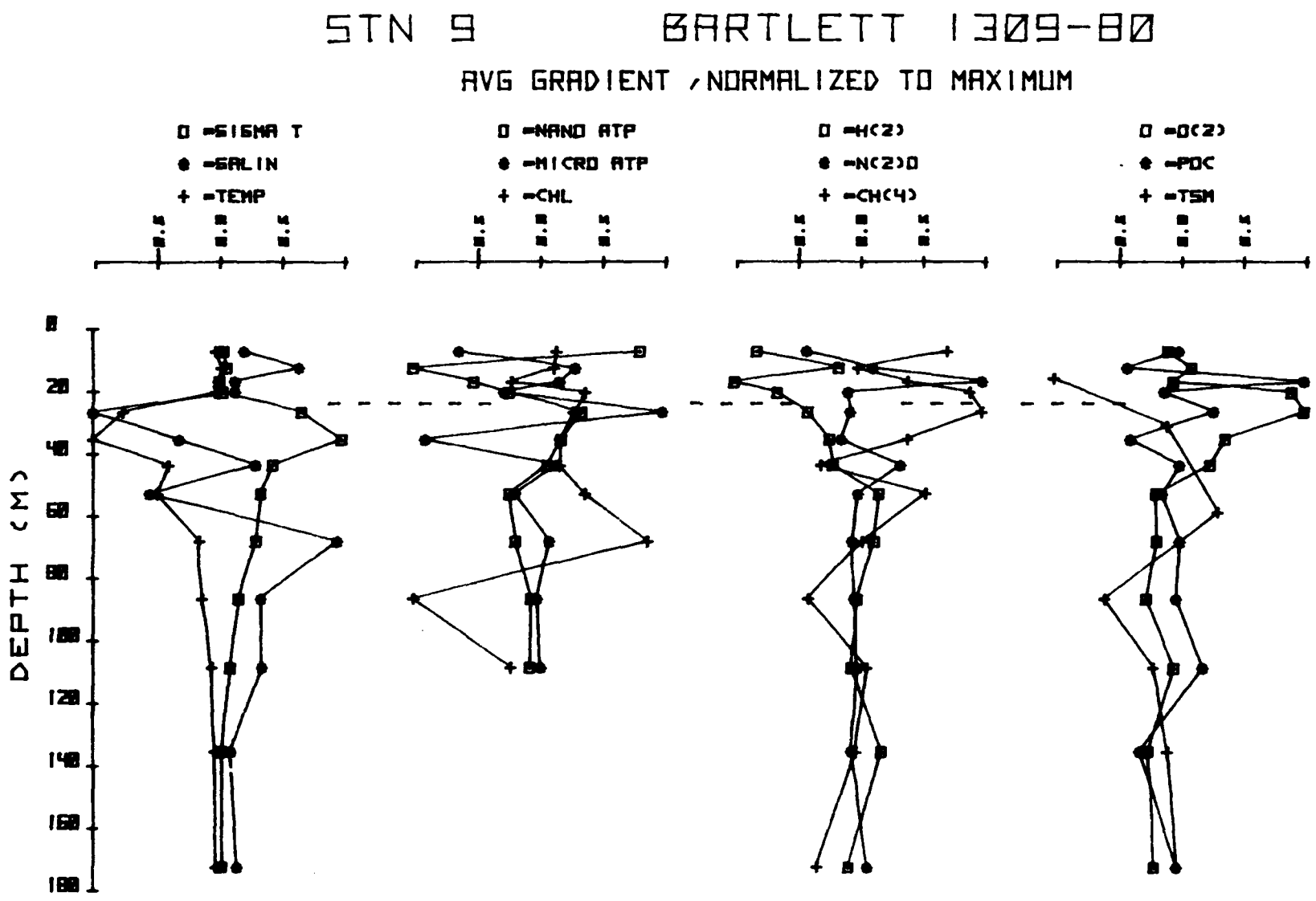
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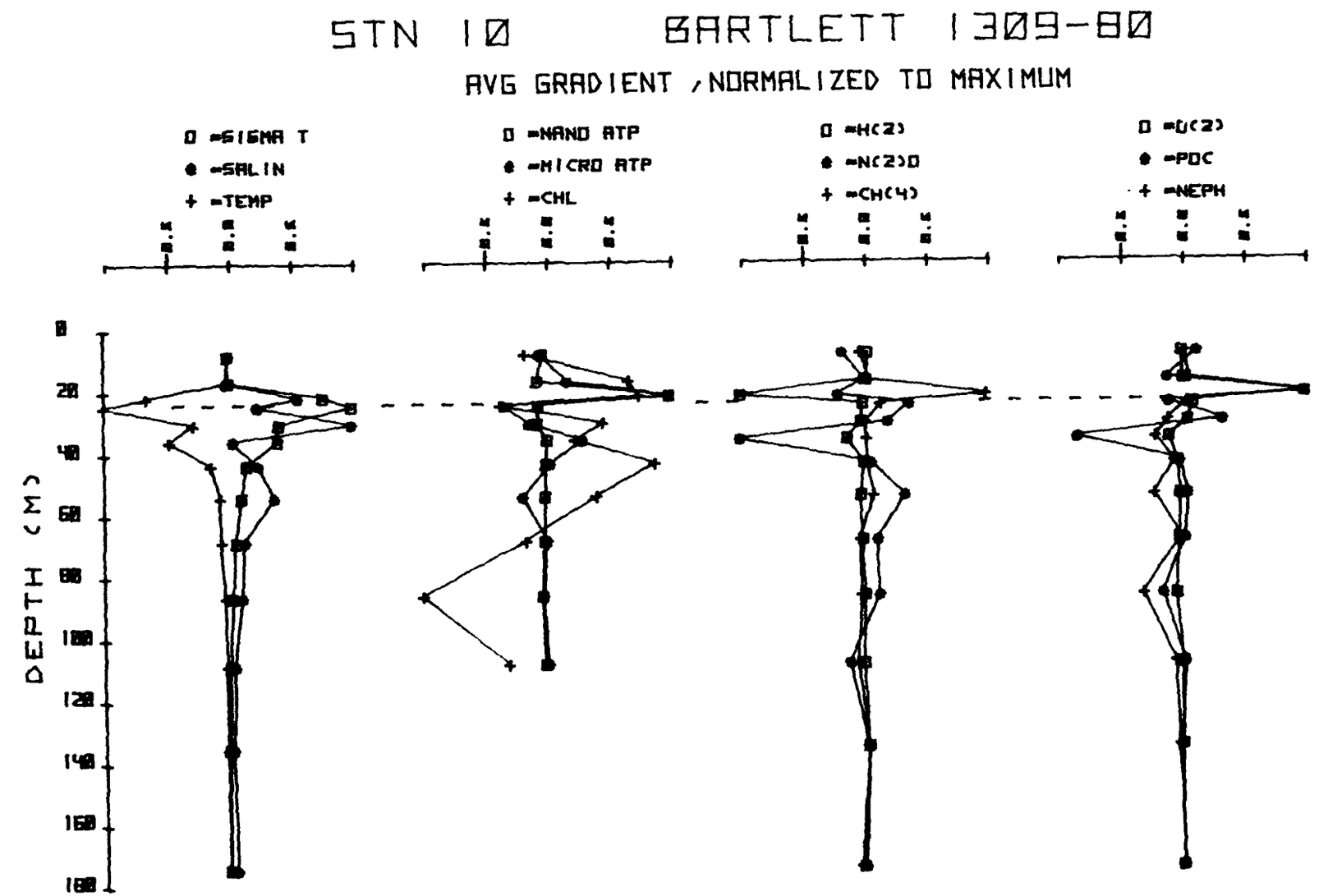
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□ =□(2)
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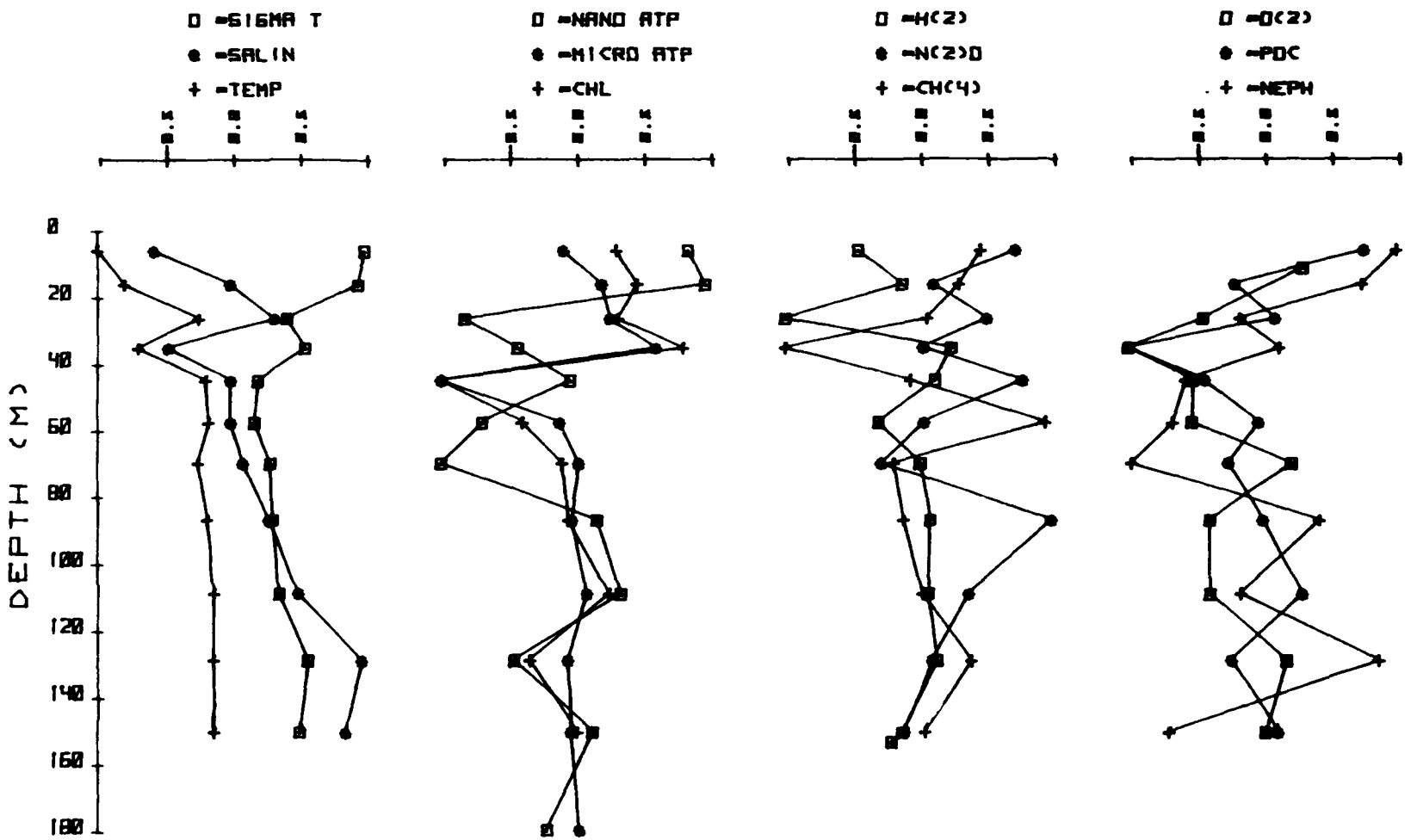
STN 11 BARTLETT 1309-80

AVG GRADIENT /NORMALIZED TO MAXIMUM



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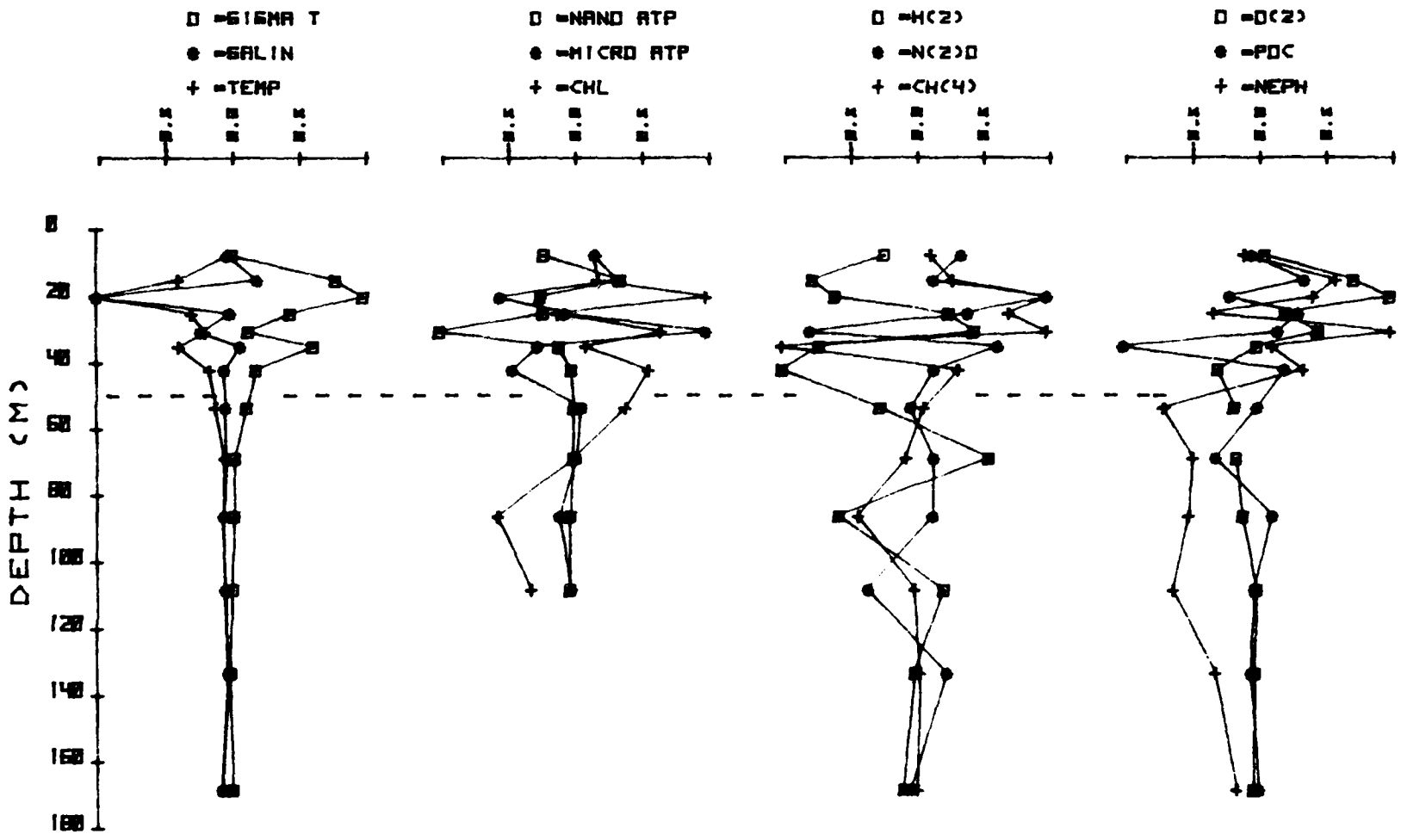

APPENDIX A: PROGRAM PARTICIPANTS

Name	Affiliation	Principal Responsibility
Reid, David F.	NORDA	CTD/Nephelometry; Chief Scientist
ABD El-Reheim, Hussein	TAMU	Nutrients
Bodennec, Guy	Centre' Oceanologique de Bretagne (FRANCE)	Methane, Nitrous Oxide
Brooks, James M.	TAMU	Methane, Nitrous Oxide
DePalma, Irene P.	NORDA	TSM, Chlorophyll analysis, ATP analysis
Din, Zubir B.	TAMU	Chlorophyll sample preparation
Hayes, Joe D.	NORDA	POC/DOC laboratory analysis
Jeffrey, Alan	TAMU U	POC/DOC sample preparation
Jones, Mark M.	NRL	Hydrogen
Lavoie, Dennis M.	NORDA	ATP sample preparation
Scranton, Mary I.	S.U.N.Y, Stony Brook	Hydrogen
Spivak, Arthur J.	MIT	Oxygen

In addition:

Schwarz, John R., Shropp, Steven J. and Cunningham, Bruce R. also participated on this cruise, performing culturing experiments to test for microbiological production of H_2, CH_4 and N_2O. Their results will be reported elsewhere.

APPENDIX B: COLLECTION AND ANALYTICAL METHODS

1. CH_4 and N_2O

Care was taken to prevent the introduction or trapping of air in the collection bottle by filling the bottle from the bottom using a piece of plastic tubing fitted to the Niskin bottle drain cock, by allowing the filled bottle to overflow, and by capping the collection bottle carefully. Analysis was begun immediately using the method of Brooks, Reid, and Bernard (1981).

In its essentials, the method consists of first separating and concentrating the dissolved gases by bubbling pure helium through the sample in a closed purging loop. The purged gases are trapped in a tube containing a hydrocarbon adsorbant cooled by liquid nitrogen. Subsequently, the gases are released from the trap by heating and are flushed with helium through a gas chromatograph fitted with a flame ionization detector (for CH_4) or an electron capture detector (for N_2O). Calibration is accomplished using standard gas mixtures; precision of the method is approximately 5.5% and the detection limit 0.2 nl/l. Single analyses were done for each gas at each depth.

2. H_2

One liter samples were drawn into special collection containers so as to minimize contamination by air and analyzed within 24 hrs by the method of Schmidt and Seiler (1974) and as modified by Herr and Barger (1978). In its essentials, the method consists of vacuum stripping the H_2 from the seawater and injecting an aliquot of the extracted gas phase into a carrier gas stream that is fitted with scrubbers to remove interfering gases. H_2 then reduces HgO, releasing a proportional amount of Hg vapor which is measured with an atomic adsorption spectrophotometer. A standard gas mixture is injected after every sample. The limit of detection is 0.2 nl/L. The values reported are the average of duplicate determinations.

3. O_2

Calibrated 125 ml glass flasks were rinsed twice with the seawater sample, then gently filled from the bottom using a short length of plastic tubing attached to the Niskin drain cock. After allowing the flask to overflow copiously, a glass stopper having a conical end to displace contaminating air bubbles was inserted.

A modified ("Micro") version of the standard Winkler titration was used to analyze for dissolved oxygen (Carpenter, 1965; U. S. Naval Oceanographic Office, 1970). Due to a procedural error, the results from stations 4 through 7 are unreliable and are not reported. The tabulated values are the average of duplicate determinations.

4. TSM

A separate hydrocast, consisting of twelve 30-liter Niskin bottles, was used to collect water for total suspended matter. These bottles were fitted with new rubber springs (to minimize the occurrence of rubber particles in the sample water) and with special taps threaded into the bottom edge to enable all the water to be drained. A short piece of plastic tubing connected each tap to a 47 mm diameter in-line filter holder (Nuclepore Corp., Pleasanton,

CA); this in turn was connected to a "catch" jug which was maintained under continuous vacuum. Each filter holder contained a tared 0.4 μm pore size Nuclepore filter.

Vacuum filtration of the seawater proceeded until either all the water was drained from the Niskin bottle or the filter clogged. Salt was removed from the filter by injecting 30 ml of filtered, distilled water into the filter holder and applying suction until the filter was dry. The filter was then placed in a 47 mm plastic culture dish (Millepore Corp., Bedford, MA), desiccated overnight, and sealed with tape. "Blank" filters were loaded, rinsed, unloaded and stored along with the test filters, but no seawater was passed through them. The volume of seawater passed through each filter was measured in the catch jugs using a calibrated dipstick. Loading and unloading of the filter membranes from the holders was done in a down-draft, laminar-air-flow hood.

At the laboratory, the filter membranes were weighed to the nearest microgram on a digital Cahn Electrobalance (Cahn Instrument Co., Cerritos, CA). Although they load up more quickly, Nuclepore filters are readily washed of salts and are not subject to the hydration problems associated with membrane filters or the fraying problems of glass fiber filters. The polycarbonate filters do tend to be prone to electrostatic effects, but this problem can be controlled by maintaining moderate humidity (approx. 70%) and using an ionization source in the weighing chamber. Single measurements were made at each depth.

5. Organic Carbon

Preparation of materials and analytical procedures generally followed those of Strickland and Parsons (1972) with some modifications. Calibrated 1 liter glass reagent bottles were rinsed and filled with the sample. Particulate and dissolved organic carbon fractions were obtained simultaneously with an in-line system: the sea water was drawn up a glass siphon tube placed in the sample bottle and through a precombusted 25 mm diameter glass-fiber filter (GF/C, Whatman Inc., Cliffton, NJ) mounted in a polycarbonate in-line holder (Nuclepore Corp.) attached to the top of the tube. The filtrate was then drawn into a 250 ml side arm flask from which it overflowed into the vacuum reservoir/waste receptacle. The filter was analyzed for particulate organic carbon (POC), and the filtrate remaining in the 250 ml flask was analyzed for dissolved organic carbon (DOC). Duplicate sample bottles were taken so that duplicate POC determinations could be made, and three replicate samples for DOC determinations were drawn by glass syringe from one of the 250 ml flasks. Reagents were added to the DOC ampules as per Strickland and Parsons (1972), but for the POC ampules, the glass-distilled water, persulfate and acid were premixed 8 hours before use for convenience and to minimize the reagent blank. This reagent solution was dispensed using an all-glass and Teflon Repipettor (Oxford Instruments Inc., Columbia, MD). The ampules were sealed using an Oceanography International Corporation (OIC, College Station, TX) Sealing/Purging Unit and were packed for transport.

At the laboratory, the ampules were cooked at 100°C overnight to complete digestion of the organic material to CO_2 and analyzed by infrared adsorption on an OIC Carbon Analyzer. Standards were run at the beginning and end of each sample set using oxalic acid dilutions prepared in ampules. The standard curve was best fitted by a quadratic equation to account for nonlinearity at the low

end of the range of concentrations encountered. Blanks on standards and samples were run according to Strickland and Parsons (1972).

On shipboard, the processing of filters and ampules was done in a downdraft, laminar-air-flow hood to minimize contamination.

6. Chlorophyll and Phaeopigment

Pigment samples were drawn into rinsed, calibrated 1 liter, brown plastic bottles, and filtered and stored according to Strickland and Parsons (1972). Duplicate samples of the total phytoplankton pigment were filtered at each depth. In addition, a second set of duplicates was prepared by passing the seawater through a 20 µm mesh nylon screen before filtering onto the glass fiber filter. Thus, two fractions, a "total" and a "< 20 µm", were obtained which, by difference, yielded the "> 20 µm" component.

The filters, stored at -20°C in a desiccator, were transported to the laboratory at the end of the cruise, and the pigments extracted by grinding and steeping in neutral 90% acetone approximately 4 to 6 hours. Chlorophyll "a" and phaeopigment "a" were measured after Strickland and Parsons (1972) using a Turner Designs Model 000-10 Fluorometer (Turner Designs, Mountain View, CA).

7. ATP

Seawater was drained through a 200 µm mesh nylon screen into rinsed brown plastic, 500 ml bottles, two bottles for each depth. The contents of one bottle were passed through 20 µm mesh nylon screen onto a 2 µm pore size Nuclepore filter to obtain particles between 20 and 2 µm. The contents of the other bottle were passed through a 2 µm filter without prefiltering through the nylon mesh to yield particles between 200 and 2 µm. This filtrate was caught in a clean flask below and was in turn passed through a 0.2 µm filter to yield a 2 to 0.2 µm fraction. Since each sample bottle was actually split into two 250 ml aliquots, the resulting sample set comprised duplicate filtrations of each of the three size fractions at each depth.

ATP values for two other size fractions were obtained by adding the results of the 200 to 2 µm fraction and the 2 to 0.2 µm fractions to yield a "total" ATP (200 to 0.2 µm) and by subtracting the results of the 20 to 2 µm from the 200 to 2 µm fraction to yield the 200 to 20 µm fraction. The names assigned to the different fractions --- "micro" for 200 to 20 µm, "nano" for 20 to 2 µm, and "pico" for 2 to 0.2 µm --- follow the eminently logical terminology proposed by Sieburth, Smetacek, and Lenz (1978) and correspond to the traditional approximate terms "net plankton", "ultra" or "nano" plankton (mostly flagellates), and "bacterioplankton".

ATP was extracted from the particles on the filters by the standard method (Holm-Hansen and Booth, 1966): as soon as the last of the seawater passed through it, the filter was removed from the filter holder and plunged into 5 ml of boiling Tris buffer (tris hydroxyaminomethane at pH 7.8, 0.05 M) contained in a 20 ml scintillation vial and boiled for at least 3 minutes. Procedural blanks were obtained by extracting filters taken straight from the box.

The extracts and filters were cooled and frozen in the vials and maintained at -20°C until analysis at the laboratory, where they were gently thawed and brought to the original 5 ml volume with "low response" water (i.e., water purified by ion exchange and reverse osmosis, neutralized with NaOH, and tested for ATP activity). Analysis was accomplished by injecting 200 µl of sample into 100 µl of purified luciferin-luciferace system (DuPont Inc , Wilmington, DL). The resulting light emission was measured in a sensitive photometer (SAI Inc., San Diego, CA), after a 10-second delay, by integrating the area under the reaction decay curve for 30 seconds. From two to four injections were made of each extract, so that each data point represents a minimum of duplicate determinations on each of two replicate filtration/extractions. Standards were made with "low response" water and pure Na-ATP salt (Sigma Chem. Corp., St. Louis, MO). Both blank and unknown concentrations were normalized to 5 ml before correcting for the blank and extrapolating back to the seawater concentration.

8. Nutrients

Samples were drawn into sterile Whirl Pak plastic bags (NASCO, Inc.) and kept at 4°C until processing, which was completed within six hours. Sample preparation followed Strickland and Parsons (1972) and analysis was performed using a Technicon Auto Analyzer (Technicon Instruments Corp., Tarrytown, NY).

9. Light Field

The depth of the 1% light level on stations 3, 6, 8, 9, and 12 was located by hand-lowering a light sensor off the sunny side of the ship. The sensor (LI-COR, Lincoln, NB) was an upward-looking, cosine-corrected type, sensitive to photosynthetically active radiation, and its output was integrated over 10-second intervals by a LI-COR quantum radiometer and normalized to the reading obtained simultaneously from an on-deck sensor.

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This report is a summary of data collected in the Mediterranean Sea during the late summer of 1980. Vertical profiles through most of the water column were obtained for the following parameters: conductivity, temperature, salinity, nephelometry, total suspended matter, dissolved and particulate organic carbon, adenosine triphosphate (ATP), chlorophyll and phaeopigments, nutrients (nitrate, ammonium, phosphate, silicate), dissolved oxygen and dissolved reduced gases (methane, hydrogem, nitrous oxide). Results are presented as: (1) tables

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of measured and derived parameters; (2) depth profiles of unnormalized values, normalized values, and normalized rates of change. Descriptions of the collection and analytical procedures are also given.

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